DOCUMENT RESUME

ED 033 082 SP 003 210

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Individually Prescribed Instruction and Academic Achievement. A Report on an Experimental Project.

Pub Date Mar 69

Note-157p.

EDRS Price MF-$0.75 HC-$7.95

Descriptors-*Academic Achievement, Elementary School Mathematics, Elementary Schools, Elementary School Students, *Individualized Instruction, Language Arts, Teacher Role

A study was designed to measure the effect of an individually prescribed instruction (IPI) program on the cognitive achievement of fourth and fifth graders. The 141 IPI students studied had been exposed for two years to the program which involved 600 students in two schools; they were compared with 198 non-IPI students from control schools matched on geographic and socioeconomic factors. Achievement tests administered to each were the Iowa Test of Basic Skills, a part-Iowa Test, a free writing sample, an IPI language test, and an IPI math test. The data analysis on 53 variables (using factorial analysis of variance and the Scheffe formula of difference between means) divided students into grades, sex, schools, and IQ levels. No significant differences between groups was established, indicating that IPI and non-IPI students achieve equally well in the areas tested. Nonsignificant trends suggest, however, that (1) IPI as a method has been most effective in the language area; (2) in mathematics, IPI students do not achieve as well as non-IPI students; (3) fifth-grade girls in the upper intelligence levels tend to achieve better in non-IPI settings than their IPI counterparts; and (4) success of an IPI program depends on content, method of administration, student characteristics, and teacher role. (A 27-item bibliography and the math test and reading test are appended.) (JS)

ED0 33082

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INDIVIDUALLY PRESCRIBED INSTRUCTION AND ACADEMIC ACHIEVEMENT

A Report On An Experimental Project

Submitted to the State Of Illinois

Department of Program Development
For Gifted Children

Rafael A. Lewy, Ed. D.

Arlington Heights, Illinois

March, 1969

SP003210

ACKNOWLEDGEMENTS

Many people have contributed in various ways to the point of view and approach here offered. Acknowledgements are due to Dr. Donald Thomas, Superintendent of School District 59, and my colleague Dr. Anne Kennard, Director of Research of School District 59, for their continuous encouragement and assistance. Likewise, I would like to express my thanks to the Center for Instructional Research and Curriculum Evaluation (CIRCE) of the University of Illinois, particularly to Thomas Bligh, Duncan McQuarrie, and Henry Slotnik of that department, and to Professor Robert Rosenmeier, of Northern Illinois University, for their valuable help.

I would like to express my indebtedness to Messrs. Phillip Thornton, Harold Hoeksema, Robert Michalsen, and Tom Powers and the faculties of Brentwood, Grant Wood, High Ridge Knolls and Ridge Schools without whose cooperation this paper could have never been written. Acknowledgements are due to Joe Judge and John Hand for their work on the IPI tests.

My special gratitude is given to Professor Lloyd McCleary,of the University of Utah, whose insights, as usual, were a source of inspiration. My secretary, Jeanne Howe, who typed the manuscript and helped me in many other ways deserves special thanks.

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INDIVIDUALLY PRESCRIBED INSTRUCTION

EVALUATION OF ACHIEVEMENT

Prepared by Dr. Rafael Lewy

SECTION I

I. BACKGROUND AND RATIONALE

The process of introducing the Individually Prescribed Instruction Program into School District 59 began during Spring 1965. At present there are two elementary schools involved in the program, Brentwood and Grant Wood. There are only a few instructional programs which have been received with such openess and excitement by segments of the public and the educational profession as has been the case with IPI. It's rationale which focuses on the individual student, as only very few programs do, has provided the basic assumption that here is a way to enable the school to provide an equally adequate education for all it's students. It is not a program geared to the needs of any particular group of children, such as the gifted, the exceptional, the culturally deprived, etc. It is a program, at least so it is perceived by its originators and followers, that will serve most segments of the student population. With this in mind District 59, particularly concerned about its programs for the gifted, submitted a proposal to the Office of the Superintendent of Public Instruction (February 1967) to evaluate the effects of IPI on the gifted student population in the schools where it has been introduced.

Owing to personnel changes in the IPI evaluation staff in the middle of the 1967-68 school year, two different evaluation strategies were pursued independently. This report only deals with certain aspects of the cognitive domain relating to achievement. The design was developed in January and February, 1968, therefore, it has not been mentioned in the original proposal. The time factor delimiting this endeavor to about the last five months of the school year, necessitated a more rigorous and definitive approach than would have been warranted under more favorable circumstances.

Individually Prescribed Instruction is based on a conceptualization of the learning process in terms of distinct behavioral objectives which differ individually in time and content. It is hypothesized that a given subject can be reduced to a logical sequence of instructional units whose successive mastery will ultimately lead the student to the more advanced stages of a skill or a discipline. These units have to be small enough in size and related to distinct demonstrable behavioral objectives that any student, given the amount of time and guidance needed, will ultimately attain mastery of the sequentially constructed subject matter. This is best explained in the words of Richard Cox: [1]

> The IPI Program centers around a statement of carefully sequenced behavioral objectives. Each objective must explain the behaviors the pupil must demonstrate for mastery of the skill and content. In general, objectives are "scaled" or ordered in that each objective builds upon the preceding ones, thus forming a continuum of learning experiences.
>
> The IPI lessons are relevant to the instructional objectives, encouraging independent work on the part of the pupil. Each learning exercise teaches an objective within the sequence, so that when the exercise is completed the pupil will have mastered a task necessary to the total objectives of the sequence. Lesson procedures must encourage individual work with teacher time being reserved to help pupils with individual problems. Materials also encourage the performance and practicing of the skills the pupil is to acquire.

IPI is a program that focuses on the learning process, concerting its formal efforts toward the attainment of skills and mastery of subject matter by adapting content and methodology of instruction to individual needs of pupils. In many respects, IPI may be regarded as a further expansion of programmed instruction. It involves all three Skinnerian tenets which are still universally regarded as the backbone of programmed materials:

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[1] Richard C. Cox, "A Description and Interim Evaluation Report Concerning the First Two Years of Individually Prescribed Instruction Project" (Mimeographed working paper, Dec. 1966) Chap. 1, p.4

1) Presentation of the lesson in small steps.
2) Arrangement for immediate reward or reinforcement of some sort immediately following each correct response.
3) Requirement of overt responses during learning.[2]

A certain amount of freedom and discretion is maintained with respect to the second principle in the IPI Program. Reinforcement is regarded as an integral part of the instructional methodology rather than a rigorously built-in part of the written program. Whereas programmed instruction, in the classic sense, provides for reinforcement with the completion of a single learning act (frame), say, exercise or problem, IPI only has such formal provision at the end of each objective, which can be contained in frequently corrected worksheets consisting of a number of problems or exercises. Further reinforcement is provided by curriculum embedded tests which are augmented by tests measuring attainment of larger units of mastery. However, a curriculum embedded test, and the student's worksheet constitute the most frequently built-in reinforcement device. Reinforcement on an even more immediate basis is a decision the teacher has to make in each individual case.

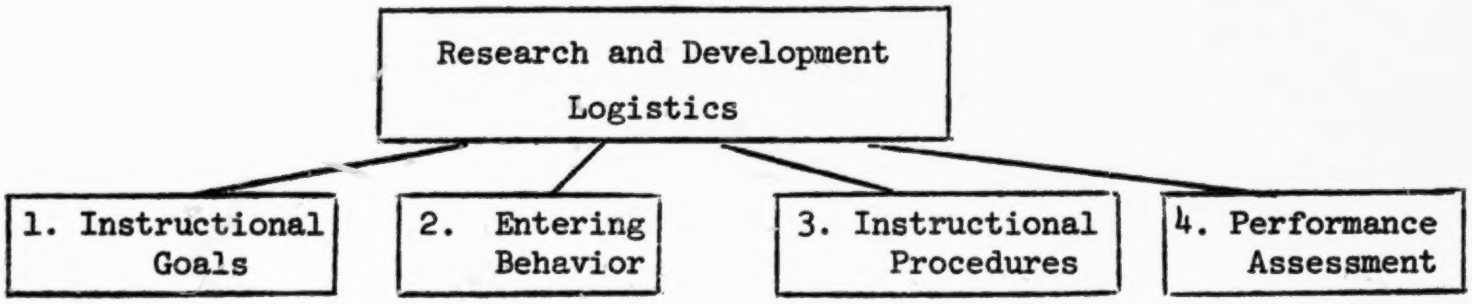
However, programmed instruction has some built-in difficulties with regard to individualization procedures. No matter how good a program, the problem arises whether it meets the needs of all children. In spite of attempts to tackle the problem in the various forms of branching procedures and other flexibility devices based on frequent feedback, Thompson makes the observation that "a single program should not be expected to be equally effective for all."[3]

---

[2] Robert T. Filep (Ed), Prospectives in Programming, The MacMillan Company, New York, 1962, p. 6.

The shortcoming of programmed instruction in the form of printed materials or teaching machines in spite of its individual pacing procedures and branching techniques consists of the technical obstacle of adapting the materials to individual behaviors and what they entail. A student starting to work on a program has to labor through the lowest to the highest levels, though at different rates, regardless of his degree of readiness and specific needs.

A departing step from the rigors of programmed instruction leading to the basic idea of IPI can be traced to a model offered by Robert Glaser.[4]


Research and Development Logistics
1. Instructional Goals
2. Entering Behavior
3. Instructional Procedures
4. Performance Assessment

The Component Phases of an Instructional System

Most programs have dealt with phases 1, 2 and 3. Phase 2, "Entering Behavior," has been usually ignored. The student on entering a program is not a tabula rasa. He brings with him various levels of readiness which relate to the various stages of the program. These levels of readiness ought to be checked and diagnosed carefully in order to make the program meaningful and effective as far as the individual is concerned. This is the parting line between programmed instruction and Individually Prescribed Instruction. "Entering Behavior" as perceived by IPI has had two general impacts on the organization of learning experiences. From the student's point of view the learning process is based on the following IPI tenets:

---

[3] Robert L. Thompson, "Programmed Instruction and Reinforcement Theory: A View from the Laboratory" in Prospectives in Programming, Robert T. Filep (Ed.), The MacMillan Company, New York, 1963, p. 26.

[4] Robert Glaser, "Research and Development Issues in Programmed Instruction" in Robert T. Filep (Ed.), Prospectives in Programming, Ibid. p. 283.

1) It (the program) starts each pupil from where he is on the learning continuum and takes him from there.
2) The instruction the student receives is differentiated according to his performance as he learns.
3) Students are differentiated according to two kinds of instructional treatments resulting from their ability to extrapolate to new knowledge, their need for additional practice and the opportunity for extended experience.
4) Quality control of student learning and attainment is accomplished by introducing the concept of mastery levels throughout the curriculum. [5]

Learning is perceived as a continuum which can be broken down into units small and manageable enough to be mastered by each individual. Individualization takes place in the form of differentiated pacing and individually prescribed learning experiences following a careful and continuous diagnosis of student's mastery and needs. Whereas any good programmed material can solve the problem of individual pacing, individual prescriptions can only be handled to a certain limit even by the best branching procedures. It is impossible to write a program that can predict all possible learning behaviors resulting from individual differences. The new factor introduced by IPI, then, is a concerted effort of program writers and classroom teachers, the latter being supported by an elaborate assortment of placement and diagnostic instruments and techniques, to provide the individual student with the right learning experiences at the right time.

---

[5] Robert Glaser, "Individualized Learning: Notes on a Rationale of a System of Individually Prescribed Instruction," Learning Research and Development Center, University of Pittsburgh, 1966 Mimeograph pp. 24-25.

From the teachers' point of view a dramatic change of role has taken place. In the traditional sense, most emphasis is put on tasks materializing from the teacher's position as "purveyor of knowledge." This concept does not particularly refer to any given teaching situation, as for example: a frontal presentation of subject matter, but rather to the fact that teachers bear the direct responsibility, and hence undertake directive initiatives not only with respect to content, but also with respect to the ways, means, media and pace in which the content is sought. In a sense, the teacher's responsibility has not changed, but there is a distinct difference in its practical manifestation in the classroom. IPI, perhaps, provides the most explicit administrative framework known sofar,created to aid and actively promote focusing on the individual child rather than on subject matter. The idea in itself is an old one. It was John Dewey who coined the phrase that the subject matter of the teacher is the student. However, in most cases the practical interpretations of Dewey's position depended on perceptions and professional abilities of individual teachers. Individually Prescribed Instruction is so structured that not working with individual students, administratively speaking, is practically impossible, and this for two reasons: IPI curtly defines instruction in terms of; 1) diagnosis, and 2) individual prescriptions.

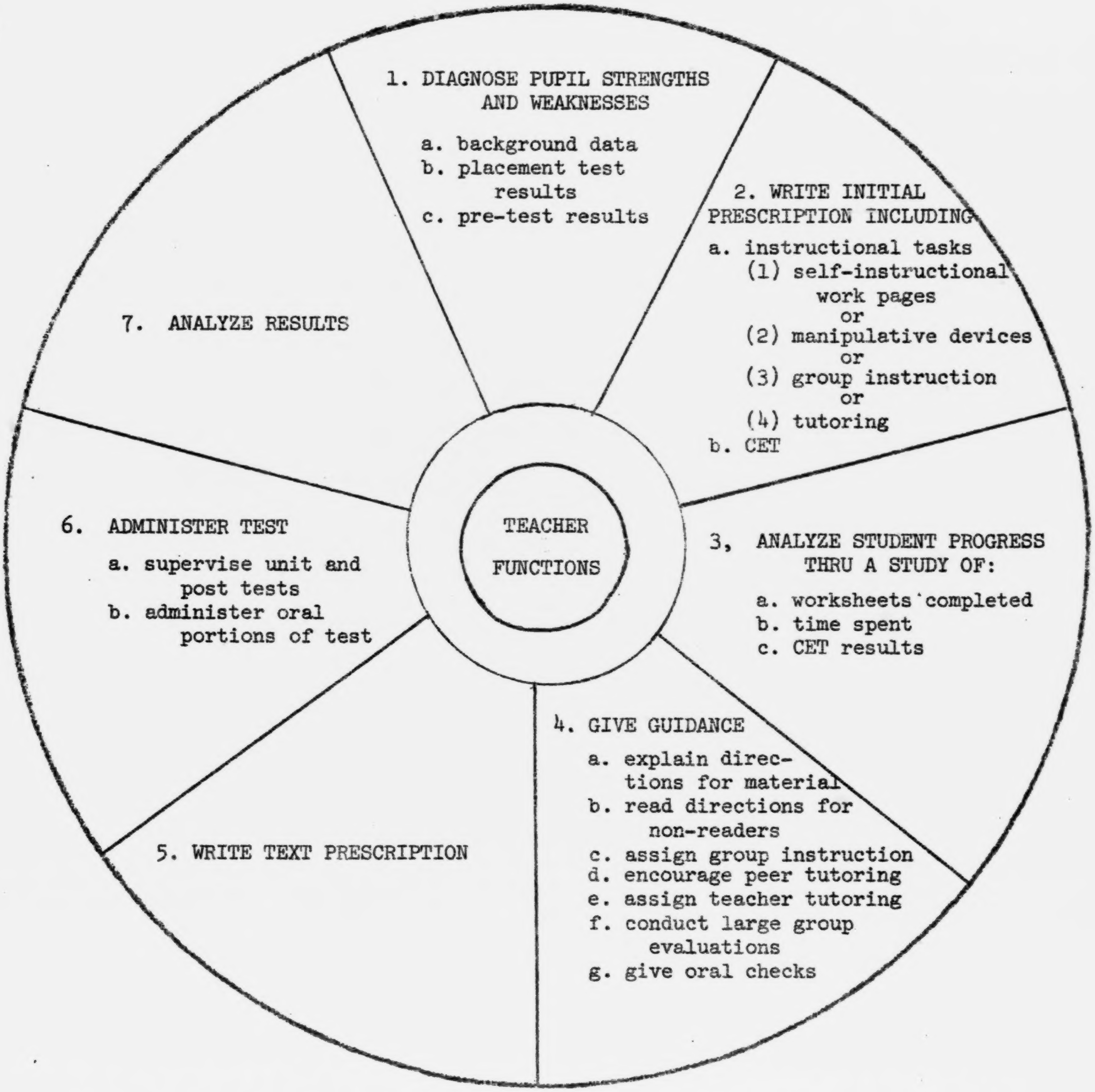
A. DIAGNOSIS

It is the basic tenet of IPI that no functional instructional activity can be effective if it is not tailored to the individual student's levels of understanding and ability. Before embarking upon the program of study, each student is carefully diagnosed with regard to his ad hoc position in the respective program in order to identify the starting point from which he has to proceed. This is done by utilizing three sets of data evolving from background data, placement tests and pre-tests. After the initial placement the function of diagnosis becomes a continuous revolving procedure accompanying the student at every step of the way. This becomes necessary in order to plan his progress on a learning continuum. Such an incessant diagnosis procedure takes many forms. Some data on which it is based is gathered from curriculum embedded tests and post-tests which come with the materials. An analysis of the worksheets is another source of information. In addition, the teacher resorts to other evaluative devices, such as oral checks, group evaluation, etc., in order to refine her diagnosis of the student's position on the learning continuum.

B. PRESCRIPTIONS

In the light of the results of the basic background diagnostic results and the "floating" diagnostic activities the student's learning program is charted out. First he is assigned to a large unit of work and later his exact position in that unit is determined. The prescriptions take a varied form depending on the nature and abilities of the individual as diagnosed by the teacher. First the basic format of work is prescribed. This can take any of the following instructional activities: self-instructional work pages, manipulative devices, group instruction or tutoring. After further diagnosis of pupil's progress these are refined by numerous guidance procedures.

The IPI teacher's functions are best described by the following model: [6]


TEACHER
FUNCTIONS
1. DIAGNOSE PUPIL STRENGTHS AND WEAKNESSES
a. background data
b. placement test results
c. pre-test results
2. WRITE INITIAL PRESCRIPTION INCLUDING
a. instructional tasks
(1) self-instructional work pages
or
(2) manipulative devices
or
(3) group instruction
or
(4) tutoring
b. CET
3, ANALYZE STUDENT PROGRESS THRU A STUDY OF:
a. worksheets completed
b. time spent
c. CET results
4. GIVE GUIDANCE
a. explain directions for material
b. read directions for non-readers
c. assign group instruction
d. encourage peer tutoring
e. assign teacher tutoring
f. conduct large group evaluations
g. give oral checks
5. WRITE TEXT PRESCRIPTION
6. ADMINISTER TEST
a. supervise unit and post tests
b. administer oral portions of test
7. ANALYZE RESULTS

---

[6] Richard Cox, Ibid. Chapter III p. 11.

It becomes clear, therefore, that in an IPI situation the teacher's main frame of reference is the individual pupil rather than the material or the classroom as a whole.

C. SAMPLE SELECTION

1. Environmental Background

Two schools have been operating the IPI programs in District 59 since 1966 - Brentwood and Grant Wood. The former is serving the Des Plaines area and the latter the Elk Grove area. These areas were identified by knowledgeable professionals as having different socio-economic characteristics.

Des Plaines is a suburban district with the average population living in homes costing between $32,000-$35,000. The average income is somewhat around $15,000 with the average breadwinner holding supervisory positions (senior and junior executives, white collar workers, free professions, sales personnel and foremen). It has been generally observed that the achievement press of this population is, comparatively speaking, high. Des-Plaines is considered to be one of the most conservative areas served by School District 59. A number of school people believe that the population's attitudes toward change and innovation in educational practices leave much to be desired. However, certain observations have been made giving rise to the question whether this "educational conservatism" is due to economic pressures inflicted on a very class-conscious group of people rather than to ideological differences.

Elk Grove maintains the typical characteristics of a suburban residential area, but some of its material and ensuing psychological attributes are not as highly skewed as in the case of Des Plaines. The estimated average income is around $11,000 a year, and the average home costs around $25,000. The achievement press in Elk Grove, as observed by knowledgeable people is in its outward manifestations, less amenable to social and psychological tensions. Elk Grove has proved itself to be more receptive to educational innovation. Bonds are more easily passed in Elk Grove than in Des Plaines. Most of the Elk Grove residents work at white collar jobs, but at lower levels of responsibility when compared to the Des Plaines population.

It was assumed that these differences have an implication on the characteristics of the target schools whose effect will be noticeable in the variables under investigation. To reduce this bias, it was decided to take two rather than one control school. Each of the control schools was matched on the environmental settings to an experimental school. The control schools were High Ridge Knolls for Des Plaines and Ridge for Elk Grove. As a matter of fact, each of the control schools is almost adjacent to its experimental counterpart. Therefore, it can be safely assumed that the experimental schools were matched on socio-economic background of its population to the controls.

2. The Stratified Population

According to District 59 student census of January 31, 1968 the following figures were given for the schools participating in this project:

	School	1st	2nd	3rd	4th	5th	Total	Classroom Teachers	Pupil Classroom Teacher Ratio
IPI	Brentwood	73	82	83	75	52	365	14	26
	Grant Wood	57	74	65	55	35	286	12	24
Non-IPI	High Ridge Knolls	63	63	68	46	53	293	11	27
	Ridge	70	87	88	96	83	424	17	25

These figures indicate that there is a similarity in student enrollment. All schools are relatively small sized with a total enrollment, discounting kindergartens and special education classes, of less than 450. With student-teacher ratios being almost identical it was assumed that the differences between school enrollments would not constitute a contaminating factor.

The strategy of resorting to a stratified population reduces the generalization of this study. The causal factor to the variability is related to time and geographic location as has been discussed in an earlier chapter.

3. Non-Random Sampling Selection

Notwithstanding the fact that IPI programs begin at the first grade level it was decided to incorporate in this study grades 4 and 5 only.[7] This was done for the following assumptions and conditions:

a) IPI began only two years prior to this examination. Based on testimony it was assumed that the most intensified work in respect to IPI strategies was performed on the grades under examination. To go any lower at this point would have slightened chances of coming up with uncontaminated results.

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[7] Joseph Hill, August Kerber: Models, Methods and Analytical Procedures in Education Research, Wayne State University Press, 1967, Chapter IV.

b) This report being summative by nature is primarily interested in the end product in achievement areas. This product, it was assumed, ought to manifest itself particularly at the two highest grade levels of the schools under investigation.

c) An important independent variable in this study is the intelligence quotient. In District 59 the first intelligence measures taken are at the third grade level. Owing to technical realities it became necessary to rely on the District's testing program for I.Q. measurements. This automatically eliminated the first two grades from the sample.

Having decided on the grade levels to be included in this study a decision was reached to include all the children attending those grade levels both in the IPI schools and in the non-IPI schools, but with the following modifications:

a) Children who were not exposed to IPI instruction for two consecutive years were excluded.

b) Children who, according to the cumulative folders, were recommended for or received special services for emotional, perceptual and other problems, were excluded.

c) Special education classes were excluded.

After the elimination process, complete data was obtained from 144 students attending IPI schools and 198 students attending non-IPI schools.

The IPI and non-IPI students were divided into two groups according to intelligence levels. This study defines the group of 110 and above on the Lorge Thorndike Test as the "high intelligence group." Those who scored 109 and below are defined as the "low intelligence group." The following table shows the breakdown of the sample according to school, grade and intelligence level. The mean intelligence level of each sub-experimental group was then compared with the mean intelligence level of its comparison sub-group by using the T Test of differences between means.

COMPARISON OF I.Q. BETWEEN IPI AND NON-IPI SCHOOLS

GRADE	MEAN I.Q.	SCHOOL	NO. OF STUDENTS	MEAN	STAND. DEV.	SCHOOL	NO. OF STUDENTS	MEAN	STAND. DEV.	t
4	High	Grant Wood	12	115.5	4.821	Ridge	43	118.139	5.245	1.542
4	High	Brentwood	25	117.320	6.207	High Ridge	9	117.555	2.985	0.105
5	High	Grant Wood	9	119.666	6.055	Ridge	38	120.631	7.509	0.351
5	High	Brentwood	14	118.357	5.899	High Ridge	18	116.944	5.400	0.683
4	Low	Grant Wood	29	101.793	5.243	Ridge	27	101.851	6.357	0.036
4	Low	Brentwood	31	99.290	6.754	High Ridge	27	101.925	4.434	1.701 *
5	Low	Grant Wood	7	102.571	5.368	Ridge	20	102.500	3.263	0.030
5	Low	Brentwood	17	99.352	7.337	High Ridge	16	96.812	10.013	0.809
		Total =	144				198	= Total of 342 students		

* Significant at the .05 level

These comparisons indicate there was no significant difference between the means of intelligence quotient of the IPI groups and the comparison groups, with one exception. The mean IQ score of the fourth grade low intelligence group at Brentwood was significantly lower than that of the comparison group at High Ridge Knolls. In spite of this fact, which will be taken to account at the interpretative phase, the IPI and non-IPI groups were overwhelmingly similar on IQ scores.

RESEARCH DESIGN

A mere comparison of achievement on a standardized test would probably produce biased results. IPI is not only a methodology, but a curriculum which defines a learning continuum. RBS (Research for Better Schools)[8] has produced some empirical evidence showing, for example, that there are substantial differences between the curriculum tested by the Iowa Test of Basic Skills and the IPI Program. Comparing the IPI continuum with the ITBS Form IV, the following conclusions were reached:

1. Out of 418 skills in the IPI mathematics continuum, 108 skills are included in the ITBS tests.
2. Of the 146 skills (mathematics) included in the IPI placement tests, 32 are tested in the ITBS Form IV.
3. In the skills tested 27 items are in arithmetic problem solving.
4. Of the 62 units included in the placement tests, 37 units are totally omitted from the ITBS Form IV.

Further indications with regard to a possible inadequacy of standardized tests to measure IPI subject matter achievement prevail throughout Cox's Report.[9]

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[8] An RBS (Research for Better Schools) Evaluation Mimeograph. 1968 pp. 61-[illegible]

[9] Cox, Ibid, Chapter VII.

Testimonies of educators who are actively engaged in IPI work substantiate this observation. This consideration has had a basic impact on the research design. Two questions were raised:

1. Is the Iowa Test of Basic Skills biased against the Elk Grove and Des Plaines IPI groups?
2. What are some means and ways to obtain unbiased achievement measures?

In order to answer the first question, the raw scores of the Iowa Test of Basic Skills Form III obtained through a District 59 testing program around March 1968 were retrieved, tallied and analyzed.

The second question has produced a multi-level strategic approach: Under the assumption that the Iowa Test does discriminate against IPI students, an attempt was made to eliminate those items which contribute to this discrimination. An independent analysis of the Iowa Test was carried out. Seventeen teachers teaching in the IPI and non-IPI classes contained in the sample were selected. Each teacher was given a copy of those pages of the Iowa Test of Basic Skills Form III which pertained to her classroom. Namely, a fourth grade teacher was only given the questions directed to fourth grades, and a fifth grade teacher was given fifth grade questions. University of Illinois computer tally sheets were attached to the materials with the request to tally each item on a five point scale to indicate the degree to which the teacher felt the content of each item was covered by the curriculum materials she was using. The scale was organized along the following pattern:

1	2	3	4	5
Not covered at all	Less than adequate coverage	Adequate Coverage	More than adequate coverage	Extremely well covered

To facilitate answers and reduce technical errors, a special tally sheet was prepared for each topic in the Iowa Test. In addition, the adequate space for marking was framed in black on each tally sheet to avoid errors. In this way, each of the seventeen teachers had to complete eleven different tally sheets. The Iowa Test subjects thus scaled were:

1. Vocabulary
2. Language skills
3. Capitalization
4. Punctuation
5. Spelling
6. Usage of language
7. Map reading
8. Reading graphs and tables
9. Knowledge and the use of reference materials
10. Arithmetic concepts
11. Problem solving

Out of seventeen teachers fifteen returned the item evaluation sheets. A breakdown produced the following categories:

Grade	School	Type	No. of Respondents
4	Grant Wood	IPI	3
4	Ridge	Non-IPI	3
4	Brentwood	IPI	1
5	Grant Wood	IPI	
5	High Ridge Knolls	Non-IPI	1
5	Ridge	Non-IPI	3
5	Brentwood	IPI	2
			15 Total

The results were transferred onto IBM punch cards. A frequency distribution was then obtained on each item. It was then decided to omit from the Iowa Test those items which either were marked 1 or 2 (not covered at all or less than adequate coverage) by, at least, three teachers of the IPI and/or the non-IPI schools. Furthermore, it was decided to omit those items which were marked 1 (not covered at all) by, at least, two teachers representing IPI and/or non-IPI schools.

The following table draws a comparison between the Iowa Test in total, and the part-Iowa Test after item elimination. The most affected subject area in the part-Iowa Test was "map reading." All the fourth grade map reading questions have been dropped and only seven questions remained for the fifth grade. The fifth grade of graph questions were reduced from 26 to 6. These facts will be taken into account at the interpretative level.

	IOWA		PART IOWA		ITEMS DROPPED FOR PART IOWA	
TEST	Gr.4	Gr.5	Gr.4	Gr.5	Grade 4	Grade 5
Vocab.	38	43	18	31	18, 19, 26, 27, 28, 29, 30, 31, 32, 34, 35, 37, 39, 40, 41, 44, 47, 48	26, 29, 31, 40, 41, 44, 47, 51, 53, 55, 65, 66
Reading	68	74	68	74	None	None
Spelling	38	43	31	38	27, 36, 37, 41, 44	40, 51, 57, 59, 61
Capitalization	39	40	30	21	25, 29, 32, 33, 38, 42, 44, 46, 48	35, 37, 44, 46, 49, 50, 55, 57, 58
Punctuation	39	40	33	29	39, 41, 42, 45, 46, 48	25, 26, 31, 39, 42, 45, 50, 51, 53, 55, 57
Usage	32	32	21	17	16, 18, 19, 22, 23, 27, 36, 37, 39, 40, 41	37--41, 45--54
Map	32	36	0	7	All	19--47
Graphs	24	26	24	6	None	23, 26, 29--46
Ref. Material	52	56	49	49	29, 42, 43, 44, 45, 48, 49, 50, 59, 60, 65, 66	45, 48, 49, 50, 76, 77, 79
Arith. Comcept	36	42	30	35	19, 21, 31, 32, 43, 50	32, 39, 47, 50, 57, 58, 62
Arith. Prob.	27	29	24	23	29, 38, 39	29, 38--40, 48, 54

A second strategy resorted to in order to enhance chances of a fair comparison was to structure achievement tests based on IPI materials. The rationale was to establish an instrument which directly related to the IPI program in order to remove the disadvantages of a conventional curriculum oriented test, even in its "purified" form. If Research For Better Schools findings with regard to the Iowa Test of Basic Skills and its relationships to the IPI program are correct, then any purification methods resorted to will not be adequate enough to solve the bias problem. On the other hand, an IPI oriented test will be an adequate counterbalance in a way that it will do to IPI students' achievement results what the Iowa Test does to non-IPI students' achievement results. A comparison between both tests would: a) throw light on the principal question of whether bias exists, and b) enable us to draw a more balanced picture with regard to achievement in general.

The IPI tests in mathematics and English were based on the IPI post-tests. It was established that the range of materials covered in grades 4 and 5 in mathematics was units C through F, and in English - units C through G. The post-tests of these units were collated and handed to District 59 curriculum coordinators in the respective fields. The coordinators were requested to compile, on the grounds of these tests, a composite multiple choice test in English and mathematics of not more than 60 items in which all levels and all units, according to IPI definitions as manifested in the post-tests, would be represented. The items on the IPI tests are analogies following the specific pattern of the IPI post-tests. After the composition of the first drafts of the IPI tests, they were tested on an independent sample and then corrected for incoherencies and other errors. The corrected forms were further inspected by experts for technical corrections. The final drafts covered the following topics:

IPI ENGLISH	IPI MATH
Phonetics	Numeration
Structure	Place Value
Vocabulary	Addition
Comprehension	Subtraction
Library Skill	Multiplication
Reference	Division
	Combination of Process
	Fractions
	Money
	Time
	Systems of Measurement
	Geometry
	Special Topics

An item analysis was performed on both tests. Later the Kuder Richardson[10] formula No. 20 was used for reliability:

IPI ENGLISH						IPI MATH					
IPI SAMPLE			NON-IPI SAMPLE			IPI SAMPLE			NON-IPI SAMPLE		
K-R 20	Standard Error	Mean Raw Score	K-R 20	Standard Error	Mean Raw Score	K-R 20	Standard Error	Mean Raw Score	K-R 20	Standard Error	Mean Raw Score
.896	3.276	29.46	.894	3.247	29.84	.930	2.907	37.07	.913	2.809	40.04

The table indicates a generally accepted reliability for both tests. A reliability coefficient of .90 is regarded to be that of a well-made standardized test. [11]

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[10] For Discussion See: Downie, N.M. and R. W. Heath, *Basic Statistical Methods* Harper and Brothers, New York 1959, pp. 192-197

[11] Ibid Downie and Heath, p. 195

The Iowa Test, the part-Iowa Test and the IPI tests were used in order to attain a balanced opinion with regard to specific subject matter achievement. To a certain degree, this part of the design also resolves the problem of test biases. However, IPI as it is perceived by some of its staunch proponents goes far beyond the realm of narrowly defined achievement scores. The question whether an evaluation project concerned only with achievement can identify some of these broader areas can not be ignored.

The following assumptions were made:

1. In order to identify traits of any kind which are related to IPI, the area to be observed must be broad enough to provide reasonable chances for these traits to manifest themselves.

   Corollary A - IPI in its formal structure is too narrowly defined to allow for broad hypothesis without a considerable risk of error which this project strives to avoid.

   Corollary B - There is no evidence, as yet, to justify an attempt to relate IPI results to broad areas of behavioral theory.
2. The traits must be observable and measurable.
3. The situations from which these measurements are taken must not be directly related to the specific edicts of a prescribed learning program.

It was assumed that a free composition henceforth referred to as "writing sample" would be compatible with the above mentioned considerations. If the IPI program stresses individual instruction and independence in the learning process more than some other programs currently practiced in District 59. Some evidence may be gleamed from a free essay which provides opportunities of self-expression.

The problem of finding an adequate topic for the writing sample became a crucial issue. Forms were sent out to all teachers teaching in grades three through five in the sample schools asking each to recommend two topics which would be suitable to these grade levels. Sixteen replies were obtained suggesting thirty-two topics. A subsequent analysis revealed that the topic "What I Want To Do When I Grow Up" was the most frequently alluded to either directly or indirectly. This theme per se seems not to impose intellectual handicaps beyond the powers of the grades under discussion, neither does it restrict lucid treatment. The only restriction imposed on the students was not to exceed the 36 lines on the legal size folio page they were presented with.

The criteria upon which the writing samples were evaluated were: 1) spelling, 2) style, 3) originality, 4) handwriting. The rationale behind these criteria was:

1. In a programmed learning situation as is emphasized by IPI a student resorts most frequently to written expression as part of the daily learning process. Such a unique experience in writing may be detected in a free composition.
2. IPI with its emphasis on individual differences may stimulate free expression.

The criteria of judgement refer to: 1) some technical aspects of writing (spelling and handwriting), and 2) some aspects of individuality as expressed by originality and style. It has not been the intent to link these criteria with any specific theory of learning or personality. Therefore, concepts like "creativity" were avoided. It was strictly assumed that if IPI or non-IPI children could be identified by trained English teachers on one or more of the four traits the interpretation of this survey could expand beyond the narrowly defined subject matter areas.

To obtain an unbiased evaluation four teachers of English in the junior high schools, which are fed by the IPI schools, were selected as judges. The writing samples were coded and carefully shuffled so that each teacher had to evaluate approximately 25% of each grade in any of the schools represented in the sample without being able to identify the school, grade or child. They were told that the writing sample was written by either fourth or fifth graders in any of the four schools. Each judge received 85 writing samples for correction. The following instructions were given: Each judge was first required to scan all the papers he was given in order to get an overall idea; then he had to evaluate each writing sample for any of the four aforementioned criteria; the quality of work on any of the four dimensions was then to be defined in terms of excellent, good, sufficient, questionable and bad. These terms were carefully chosen by staff members of The Center of Instructional Research and Curriculum Evaluation basing their considerations on empirical evidence showing that these words lend themselves to more unilateral use than others. Having indicated his feelings about the quality of each writing sample on each of the four dimensions by choosing one of the prescribed evaluative terms, the judges then were required to re-read the writing sample and give an overall judgement resorting to the same evaluative terminology. Thus a fifth dimension was obtained which is not the mathematical total of the other four, but an independent evaluation. The design of the writing sample evaluation was based in a way that; 1) the judges were independent, 2) the writing samples were coded, 3) the evaluative criteria were clearly defined, and 4) the judges were evenly distributed over the writing sample.

In total it was maintained that problems of bias were sufficiently reduced as not to necessitate any further statistical manipulations such as weighting.

E. DATA COLLECTION

The data collection began in February, 1968 with the examination of the cumulative files in the four schools. The data extracted consisted of independent variables such as: name of student, name of school, grade, I.Q., age, sex, father's years of schooling, and does mother work. In the analysis only four of these variables were treated, and these consisted of: school, grade, I.Q. and sex. Collaterally the work on the part-Iowa Test was inaugurated. Teachers were given their evaluation kits. During the months of March and April, the Iowa Test raw scores were retrieved and analized. At the end of April and during the month of May the classroom teachers of the participating grades were given the forms of the IPI tests and the writing sample. No time restrictions were imposed, but it was assumed, and later verified, that the average time for writing either of the tests would not exceed 45 minutes. There was no time restriction imposed on the writing sample. The tests were administered by the teachers in approximately the same week. Such strategy, of course, created the risk of contaminating interaction, however, as it turned out later, this did not occur. The gain of relying on teachers' discretion was the avoidance of unwarranted tension usually produced by obtrusive interference in the classroom setting by outside people. The fact that the teachers themselves handled the testing situations prevented undue anxiety situations and undesirable interference with the schools' regular work.

The data was accumulated in the central office. The segments which were designed for machine scoring were sent to CIRCE at the University of Illinois (IPI English and teacher evaluation of Iowa Test of Basic Skills).

The math IPI test and the writing sample were scored by hand. The complete data was recorded on 8 x 11" index cards arranged according to a pre-determined coding system making it possible to transfer the information to IBM cards.

F. PROCEDURE FOR ANALYSIS OF DATA

A 4 x 2 x 2 x 2 factorial experiment was employed. The factors being: 4 schools (Brentwood, Grant Wood, Ridge and High Ridge Knolls), 2 grades (fourth and fifth), 2 sexes (boys and girls), and 2 Intelligence levels (high and low). This analysis of variance had unequal N's for each treatment combination. Therefore, the design is not balanced and the analysis of variance is only approximate. The approximated method of unweighted means was used.[12] The BELANOVA Program was used for this type of analysis.

The factorial experiment only determines the existence of differences. In order to obtain a meaningful interpretation a comparison of means two at a time following a significant F Test was performed. This being a posterior comparison is comensurate with the Scheffe' method owing to its applicability to groups of unequal sizes and its suitability for any comparison. Scheffe's method is also known for its insensitivity to departures from normality and homogeneity of variance. The Scheffe' method is more rigorous than other multiple comparison methods with regard to type 1 error.[13]

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[12] B. J. Winer, Statistical Principles in Experimental Design, McGraw Hill, New York, 1962, pp. 224-227 and 241-244.

[13] George A. Ferguson, Statistical Analysis in Psychology and Education, McGraw Hill, Second Edition, 1966, pp. 294-297.

For this reason, some authorities recommend to reject a null hypothesis at the .01 level, the formula being:

$$F = \frac{(X1+2 - X3+4)^2}{SW^2/(n1 + n2) + SW^2/(n3 + n4)}$$

$$\text{and } F^1 = (K - 1)\,F$$

Even under such consideration chances are slim that a field study of this type will produce any significant differences according to the mandates of this formula.[14]

G. LIMITATIONS OF DATA COLLECTING PROCEDURES

IPI in its broadest theoretical sense is contingent upon most major aspects of the educational process. Consequently, hypotheses in the affective domain are not only legitimate, but most warranted. The restriction of this evaluation to achievement aspects is by no means a repudiation of the affective domain, but merely a matter of technical imperative. An apriori decision was made to exclude the affective domain from the data collection procedures. Another restriction reflects upon the technical administration procedures of IPI.[15] It may be hypothesized that achievement in the IPI program is contingent upon the many technical aspects of IPI administration in the classroom. To test out all possible variations of such hypothesis was beyond the scope of this survey. It was maintained that such strategy should be reserved for further in-depth study.

During the data collection process the following additional information was recorded, but not analyzed: 1) child's age by month and year, 2) years of father's schooling, 3) whether child's mother was professionally en
This information was not anaylyzed because it became quite
evident that these independent variables did not produce sufficient variability in the sample.

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pp. 483-484

[14] William Hays, Statistics for Psychologists, Holt Rinehart & Winston 1965

[15] Gil Boyer and Robert Scanlon have prepared a checklist of 10 questions relating to IPI administration in the classroom all referring to teacher adherence to formal aspects concerning IPI administration. Stencil Jan

SECTION II.

II. RESULTS

The analysis of 53 variables drawing comparisons between IPI and non-IPI schools is herewith presented.

A. 1. The Iowa Test of Basic Skills

The analysis of the fourteen following variables is produced to reject the hypothesis that fourth and fifth graders in IPI settings as provided by School District 59 do not achieve better results when measured on the Iowa Test of Basic Skills.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE I
IOWA VOCABULARY

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	260.098	3	86.699	2.113
Grade	1.107	1	1.107	0.027
Sex	122.929	1	122.929	2.996
I.Q.	2344.050	1	2344.050	57.122 **
School x grade	60.371	3	20.124	0.490
School x sex	47.395	3	15,798	0.385
School x I.Q.	165.778	3	55.259	1.347
Grade x Sex	21.848	1	21.848	0.532
Grade x I.Q.	55.374	1	55.374	1.349
Sex x I.Q.	29.123	1	29.123	0.710
School x grade x sex	46.826	3	15.608	0.380
School x grade x I.Q.	7.178	3	2.393	0.058
School x sex x I.Q.	191.809	3	63.936	1.558
Grade x sex x I.Q.	16.049	1	16.049	0.391
School x grade x sex x I.Q.	348.761	3	116.254	2.833 *
Total	12721.200	310	41.036	

*F is significant with probability less than .05
**F is significant with probability less than .01

Table 1 - It has been established that significant differences in achievement on vocabulary are mainly due to I.Q. This difference, however, as shown by the significant interaction between school x grade x sex x I.Q. is, in part, dependent on the other three variables.

Whenever the school factor is involved in significant differences a subsequent analysis based on the Scheffe method is used to establish whether these differences are due to the differences between IPI and non-IPI schools.

TABLE 1a

I.T.B.S. VOCABULARY
Comparison of Means two at a time

			SCHOOLS								
			IPI				NON-IPI				
GRADE	SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	F	H	10	28.6	5	27	18	28.7	4	30	0.164
5	F	H	3	22,5	5	26.1	16	26.8	12	32.5	3.060
4	M	H	15	26.5	7	27.1	25	28.2	5	29.8	0.975
5	M	H	11	29.4	4	31.5	22	29.6	6	25.2	0.404
4	F	L	15	22.6	16	22.7	9	26.6	16	22.6	0.650
5	F	L	13	22.5	4	26.7	7	26.8	8	19.2	0.105
4	M	L	16	19	13	25.2	18	23.8	11	21.8	0.562
5	M	L	4	18.8	3	18.3	13	21.1	8	23.8	1.605

Table 1a - The table of comparison between means, two at a time, shows no significant differences between IPI and non-IPI students at any level. The null hypothesis of no difference can, therefore, not be rejected. However, the F score of fifth grade girls of the high intelligence group is much larger than any of the other F scores in this table. This is due to the fact that the difference between the means of the two groups is relatively high in favor of the non-IPI group.

The interaction on the vocabulary variable is partly accounted for by the following phenomena. In the two IPI schools and one control school (Ridge) the fifth grade high I.Q. boys achieve considerably higher results than fifth grade high I.Q. girls. At High Ridge Knolls School (non-IPI) this process is reversed, namely the fifth grade high I.Q. girls achieve considerably higher results than the the fifth grade high I.Q. boys. By the same token, the fifth grade low I.Q. girls achieved considerably better results than the fifth grade low I.Q. boys in the three schools. Again, at High Ridge Knolls the process is reversed - the fifth grade low I.Q. boys achieved considerably better results than the fifth grade low I.Q. girls.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 2
IOWA READING COMPREHENSION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1825.048	3	608.349	4.053 **
Grade	785.648	1	785.648	5.234 *
Sex	690.068	1	690.068	4.597 *
I.Q.	4095.793	1	4095.793	27.287 **
School x grade	281.523	3	93.841	.625
School x sex	393.301	3	131.100	.873
School x I.Q.	716.698	3	238.899	1.592
Grade x sex	103.217	1	103.217	.688
Grade x I.Q.	6.592	1	6.592	.044
Sex x I.Q.	9.865	1	9.865	.066
School x grade x sex	192.241	3	64.080	.427
School x grade x I.Q.	77.080	3	25.693	.171
School x sex x I.Q.	1768.635	3	589.545	3.928 **
Grade x sex x I.Q.	9.354	1	9.354	.063
School x grade x sex x I.Q.	997.766	3	332.589	2.216
Total	46531.493	310	150.102	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 2 - Significant differences in reading comprehension are accounted for by differences between schools, differences between grades, differences between sexes and differences between I.Q. levels. All these main effects with the exception of grade levels, are dependent on one another as indicated by the significant interaction of school x grade x sex.

TABLE 2a

IOWA READING COMPREHENSION
Comparison of Means two at a time

SCHOOLS

IPI				NON-IPI				
N	School 1	N	School 2	N	School 3	N	School 4	F RATIO
87	36.013	57	38.583	28	43.308	70	37.315	8.800

Table 2a - A comparison between IPI and non-IPI schools indicates no significant differences, although the means of the non-IPI schools are higher.

TABLE 2b

IOWA READING COMPREHENSION

Comparison of Means two at a time

		SCHOOLS								
		IPI				NON - IPI				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	40.783	10	38.000	34	50.569	16	40.333	6.255
M	H	26	41.627	11	41.946	47	44.017	11	38.167	0.211
F	L	28	34.641	20	40.219	16	43.595	24	27.844	1.156
M	L	20	27.000	16	34.167	37	35.049	19	34.915	3.230

Table 2b - A comparison between means, two at a time, reveals no significant differences between IPI and non-IPI students at any level. However, the F ratio of high I.Q. girls is relatively much larger than the F's of the other levels. The table reveals that this is due to the relatively higher means in favor of the non-IPI groups. The same, although to a less degree, can be said about the low intelligence non-IPI male group.

The interaction on the reading comprehension variable is partly accounted for by the fact that in the IPI schools the highly intelligent boys have achieved better results than the highly intelligent girls. This process is reversed in the non-IPI schools where the highly intelligent girls are doing considerably better on the reading variable than the highly intelligent boys. By the same token, High Ridge Knolls stands out again by the fact that contrary to the other three schools its low I.Q. boys achieved considerably higher results than the low I.Q. girls.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 3
IOWA SPELLING

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	395.536	3	131.845	2.642 *
Grade	63.747	1	63.747	1.277
Sex	1024.705	1	1024.705	20.532 **
I.Q.	1005.388	1	1005.388	20.145 **
School x grade	329.311	3	109.770	2.199
School x sex	260.820	3	86.940	1.742
School x I.Q.	270.806	3	90.269	1.809
Grade x sex	7.272	1	7.272	.146
Grade x I.Q.	94.758	1	94.758	1.899
Sex x I.Q.	39.484	1	39.484	.791
School x grade x sex	75.887	3	25.296	.507
School x grade x I.Q.	44.170	3	14.723	.295
School x sex x I.Q.	360.651	3	120.217	2.409
Grade x sex x I.Q.	1.261	1	1.261	.025
School x grade x sex x I.Q.	141.777	3	47.259	.947
Total	15471.633	310	49.906	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 3 - Schools differ significantly on spelling results. However, the difference between sexes and the difference between I.Q. levels is much more significant.

TABLE 3a

IOWA SPELLING
Comparison of Means two at a time

SCHOOLS								
IPI				NON - IPI				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	24.837	57	24.296	128	26.547	70	22.972	0.729

Table 3a - There is no significant difference between IPI and non-IPI schools. It may, therefore, be assumed that the diversity of the four schools cuts across the lines of the IPI program on this variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 4
IOWA CAPITALIZATION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	361.058	3	120.353	2.611 *
Grade	12.470	1	12.470	.271
Sex	737.860	1	737.860	16.007 **
I.Q.	1623.428	1	1623.428	35.220 **
School x grade	176.126	3	58.709	1.274
School x sex	303.560	3	101.187	2.195
School x I.Q.	35.106	3	11.702	.254
Grade x sex	.327	1	.327	.007
Grade x I.Q.	43.757	1	43.757	.949
Sex x I.Q.	5.445	1	5.445	.118
School x grade x sex	276.742	3	92.247	2.001
School x grade x I.Q.	208.279	3	69.426	1.506
School x sex x I.Q.	140.122	3	46.707	1.013
Grade x sex x I.Q.	72.650	1	72.650	1.576
School x grade x sex x I.Q.	131.673	3	43.891	.952
Total	14289.142	310	46.094	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 4 - Schools differ significantly on capitalization results and so do sexes and I.Q. levels. As in all similar cases denoting significant differences on the sex variable, it is the girls achieving better results than boys. This fact concurs with findings of other investigations. However, difference in achievement based on the sex factor in isolation from the school factor has no other meaning in this report than a corroboration of the preciseness of measurement.

TABLE 4a

IOWA CAPITALIZATION
Comparison of Means two at a time

SCHOOLS								
I. P. I.				NON - I. P. I.				
N	School 1	N	School 2	N	School 3	N	School 4	F Ratio
87	22.025	57	23.829	128	25.488	70	23.857	8.545

Table 4a - There is no significant difference between IPI and non-IPI schools. The null hypothesis of no difference can, therefore, not be rejected. However, the means of the four groups reveal, that the non-IPI schools have achieved better results in capitalization than the IPI groups. Although the differences are statistically not significant the relatively high F ratio can not be ignored.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 5
IOWA PUNCTUATION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	272.364	3	90.788	1.760
Grade	55.200	1	55.200	1.070
Sex	647.552	1	647.552	12.555 **
I.Q.	2017.908	1	2017.908	39.125 **
School x grade	246.820	3	82.273	1.595
School x sex	152.725	3	50.908	.987
School x I.Q.	30.795	3	10.265	.199
Grade x sex	29.774	1	29.774	.577
Grade x I.Q.	84.368	1	84.368	1.636
Sex x I.Q.	,701	1	.701	.014
School x grade x sex	294.496	3	98.165	1.903
School x grade x I.Q.	220.491	3	73.496	1.425
School x sex x I.Q.	183.521	3	61.174	1.186
Grade x sex x I.Q.	.785	1	.785	.015
School x grade x sex x I.Q.	229.004	3	76.335	.148
Total	15988.447	310	51.576	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 5 - Schools do not differ significantly in performance on punctuation. Girls achieve better results than boys and high I.Q. groups achieve significantly better results than low I.Q. groups.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 6 IOWA USAGE OF WORDS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	229.057	3	76.352	2.070
Grade	.471	1	.471	.013
Sex	361.805	1	361.805	9.811 **
I.Q.	895.534	1	895.534	24.283 **
School x grade	110.688	3	36.896	1.000
School x sex	43.546	3	14.515	.394
School x I.Q.	58.624	3	19.541	.530
Grade x sex	.196	1	.196	.005
Grade x I.Q.	29.516	1	29.516	.800
Sex x I.Q.	15.453	1	15.453	.419
School x grade x sex	98.922	3	32.974	.894
School x grade x I.Q.	158.716	3	52.905	1.435
School x sex x I.Q.	145.411	3	48.470	1.314
Grade x sex x I.Q.	42.969	1	42.969	1.165
School x grade x sex x I.Q.	209.844	3	69.948	1.897
Total	11432.276	310	36.878	

* F is significant with probability less than .05

** F is significant with probability less than .01

Table 6 - Schools do not differ significantly in performance on usage of words. Girls achieve significantly better results than boys and high I.Q. groups achieve significantly better results than low I.Q. groups.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 7
IOWA TOTAL LANGUAGE TEST

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	3527.309	3	1175.770	2.296
Grade	125.365	1	125.365	.245
Sex	10741.833	1	10741.833	20.977 **
I.Q.	21563.815	1	21563.815	42.110 **
School x grade	2653.591	3	884.530	1.727
School x sex	2561.300	3	853.767	1.667
School x I.Q.	934.640	3	311.547	.608
Grade x sex	64.395	1	64.395	.126
Grade x I.Q.	958.978	1	958.978	1.873
Sex x I.Q.	179.162	1	179.162	.350
School x grade x sex	1667.216	3	555.739	1.085
School x grade x I.Q.	2172.323	3	724.108	1.414
School x sex x I.Q.	2753.124	3	917.708	1.792
Grade x sex x I.Q.	4.863	1	4.863	.01
School x grade x sex x I.Q.	2532.455	3	844.152	1.648
Total	158745.330	310	512.082	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 7 - The scores compared herewith are the mean scores for the six variables analyzed in the previous tables which describe different areas of language competency. It can be said, in general, that there is no overall difference between the four schools in the area of language as measured by the Iowa Test of Basic Skills. The significant differences which have been consistently reappearing and are strongly accentuated in this table are due to sex differences (girls doing better than boys) and I.Q. differences (high I.Q. groups doing better than low I.Q. groups).

B. ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 8

IOWA MAP READING

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	123.275	3	41.092	1.461
Grade	666.933	1	666.933	23.708 **
Sex	3.674	1	3.674	.131
I.Q.	876.463	1	876.463	31.156 **
School x grade	20.400	3	6.800	.242
School x sex	17.658	3	5.886	.209
School x I.Q.	34.128	3	11.376	.404
Grade x sex	.020	1	.020	.001
Grade x I.Q.	84.226	1	84.226	2.994
Sex x I.Q.	8.993	1	8.993	.320
School x grade x sex	51.428	3	17.143	.609
School x grade x I.Q.	76.654	3	25.551	.908
School x sex x I.Q.	391.542	3	130.514	4.639 **
Grade x sex x I.Q.	3.685	1	3.685	.131
School x grade x sex x I.Q.	37.692	3	12.564	.447
Total	8720.682	310	28.131	

* F is significant with probability less than .05

** F is significant with probability less than .01

Table 8 - The grade and I.Q. levels are discriminating factors with fifth grades performing significantly better than fourth grades and high I.Q. groups performing significantly better than low I.Q. groups. Although school and sex as main effects do not discriminate on this variable, there is a significant interaction of school x sex x I.Q.

TABLE 8a

IOWA MAP READING

Comparison of Means two at a time

		SCHOOLS								
		I. P. I.				NON - I. P. I.				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	17	10	16.7	4	20.8	16	19.5	6.921
M	H	26	18.5	11	19.5	7	19.5	11	16.1	0.002
F	L	18	14.5	20	15.8	16	15	24	12	2.629
M	L	20	13	16	14.1	31	15.4	19	17.3	5.160

Table 8a - An analysis of the interaction school x sex x I.Q. does not reveal any significant differences between IPI and non-IPI schools. The null hypothesis of

Table 8a (cont'd)

no difference can, therefore, not be rejected. However, two relatively high F ratios stand out. These are the F ratios of highly intelligent girls and boys of the low intelligence group. The means of both groups reveal that the non-IPI groups in both cases had higher scores. Although not having statistical significance, these results follow a certain pattern.

The interaction on the map reading variable is partly accounted for by the fact that in the IPI schools the highly intelligent boys have achieved better results than the highly intelligent girls. This process is reversed in the non-IPI schools, where the highly intelligent girls have achieved better results on map reading that the highly intelligent girls. Contrary to the other three schools the High Ridge Knolls low IQ boys achieved considerably better than the low IQ girls.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 9

IOWA GRAPHS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	274.239	3	91.413	3.983 **
Grade	5.229	1	5.229	.228
Sex	19.521	1	19.521	.851
I.Q.	585.035	1	585.035	25.492 **
School x grade	43.284	3	14.428	.629
School x sex	34.659	3	11.553	.503
School x I.Q.	41.931	3	13.977	.609
Grade x sex	5.671	1	5.671	.247
Grade x I.Q.	.822	1	.822	.036
Sex x I.Q.	62.882	1	62.882	2.740
School x grade x sex	43.210	3	14.403	.628
School x grade x I.Q.	10.698	3	3.566	.155
School x sex x I.Q.	38.495	3	12.832	.559
Grade x sex x I.Q.	26.613	1	26.613	1.160
School x grade x sex x I.Q.	34.834	3	11.611	.506
Total	7114.433	310	22.950	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 9 - Schools are significantly different on the graph variable. The I.Q. is another discriminating factor with the low I.Q. groups performing significantly better than the high I.Q. groups.

TABLE 9a

IOWA GRAPHS

Comparison of Means two at a time

N	School 1	N	School 2	N	School 3	N	School 4	F RATIO
87	12.141	57	14.334	128	12.992	70	13.723	0.211

Table 9a - An analysis of the school factor shows no significant differences between IPI and non-IPI schools on the graph variable. The null hypothesis of no differences cannot, therefore, be rejected. The low F ratio discloses that the differences are not affected by the IPI program.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 10
IOWA REFERENCES

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1138.043	3	379.348	4.889 **
Grade	791.899	1	791.899	10.206 **
Sex	1267.849	1	1267.849	16.340 **
I.Q.	2673.318	1	2673.318	34.453 **
School x grade	320.024	3	106.675	1.375
School x sex	329.482	3	109.827	1.415
School x I.Q.	28.942	3	9.647	.124
Grade x sex	51.098	1	51.098	.659
Grade x I.Q.	281.887	1	281.887	3.633
Sex x I.Q.	.062	1	.062	.001 **
School x grade x sex	83.770	3	27.923	.360
School x grade x I.Q.	82.100	3	27.367	.353
School x sex x I.Q.	747.938	3	249.313	3.213 *
Grade x sex x I.Q.	8.425	1	8.425	.109
School x grade x sex x I.Q.	885.179	3	295.060	3.803 **
Total	24053.840	310	77.593	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 10 - Schools are significantly different on the reference variable. The second main effect which accounts for the differences is the grade level with the fifth graders performing significantly better than the fourth graders. Sex as a main effect also accounts for the differences. Girls are performing significantly better than boys. I.Q. also discriminates significantly with the high I.Q. groups performing significantly better than the low I.Q. groups. These main effects interact with one another as shown by the significant interactions of school x sex x I.Q. and School x grade x sex x I.Q.

TABLE 10a

IOWA REFERENCES
Comparison of Means two at a time

SCHOOLS								
I. P. I.				NON - I. P. I.				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	27.822	57	31.425	128	33.845	70	30.171	11.707

Table 10a - A comparison between IPI and non-IPI schools discloses no significant difference. The null hypothesis of no difference can, therefore, not be rejected. However, the relatively high F ratio indicates a relatively high difference between the means in favor of the non-IPI schools.

TABLE 10b

IOWA REFERENCES

Comparison of Means two at a time

		SCHOOLS								
		I. P. I.				NON- I. P. I.				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	32.85	10	35.50	34	39.95	16	37.42	5.361 *
M	H	26	30.4	11	33.25	47	33.86	11	29.00	0.832
F	L	28	29.81	10	29.72	16	34.58	24	25.06	0.229
M	L	20	18.218	16	27.23	31	26.00	19	28.24	3.779

Table 10b - The analysis of the school x sex x I.Q. interaction effect reveals no significant differences between IPI and non-IPI schools at any level. The null hypothesis of no difference can, therefore, not be rejected. However, two relatively high F ratios stand out, that of the high intelligence girl groups and that of the low intelligence boys group. In comparing the means of the IPI groups with those of the non-IPI groups in both cases, the averages favor the non-IPI groups, namely that girls of the high intelligence group and boys of the low intelligence group tend to achieve better results on the reference variable in non-IPI schools.

The High Ridge Knolls School continues to show the same deviating traits from the other three schools in that its low boys group tend to obtain higher results than its low girls group, whereas the process in the other three schools is reversed.

TABLE 10c

IOWA REFERENCES

			SCHOOLS								
			IPI				NON - IPI				
GRADE	SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	F	H	10	32.70	5	32	16	36.33	4	30.00	0.993
5	F	H	3	33	5	39	18	43.56	12	42.83	3.586
4	M	H	15	27.27	7	27	25	32.12	5	30.6	0.095
5	M	H	11	33.54	4	39.5	22	35.6	6	29.33	1.217
4	F	L	15	30.4	16	25.44	9	37.71	16	26.37	0.933
5	F	L	13	29.23	4	34	7	31.44	8	23.75	1.659
4	M	L	16	20.94	13	28.46	18	27.22	11	23.73	0.469
5	M	L	4	15.5	3	26	13	26.77	8	32.75	5.539

Table 10c - A comparison between IPI and non-IPI schools on the school x grade x sex x I.Q. interaction reveals no significant differences at any of the compared levels. Therefore, the null hypothesis of no differences cannot be rejected. However, two relatively high F ratios stand out. That of the high fifth grade girls and the low fifth grade boys. In both cases the means indicate an advantage in favor of the non-IPI schools.

Comparing some of the means within the groups, there is a slight indication that the highly intelligent boys in the fifth grades of the IPI schools tend to achieve a little better than the high intelligence girl groups of these grades in the same schools. This process is grossly reversed in the non-IPI schools where the means of the girls are much higher than that of the boys.

The low fifth grade boys at High Ridge Knolls tend to achieve better results than the girls of the same level. This is reversed in the other three schools.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 11
IOWA TOTAL - MAP READING, GRAPHS AND REFERENCES

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	4705.364	3	1568.455	4.353 **
Grade	3377.556	1	3377.556	9.375 **
Sex	590.485	1	590.485	1.639
I.Q	9828.694	1	9828.694	27.281 **
School x grade	1039.256	3	346.419	.962
School x sex	468.079	3	156.026	.433
School x I.Q.	288.298	3	96.099	.267
Grade x sex	2.095	1	2.095	.006
Grade x I.Q.	479.691	1	479.691	1.331
Sex x I.Q.	293.043	1	293.043	.813
School x grade x sex	193.777	3	64.592	.179
School x grade x I.Q.	703.556	3	234.519	.651
School x sex x I.Q.	2654.839	3	884.946	2.456
Grade x sex x I.Q.	29.046	1	29.046	.081
School x grade x sex x I.Q.	1776.074	3	592.025	1.643
Total	111686.320	310	360.278	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 11 - This total score is composed of the composite mean of the map reading, graphs and reference variables. All three factors measure some of the students' abilities to handle reference materials. The analysis of variance table shows significant differences at school, grade, and I.Q. levels with no significant interactions. The fact that fifth graders achieve better results than fourth graders and that the high I.Q. groups achieved better results than the low I.Q. groups was within the framework of expectations.

TABLE 11a IOWA TOTAL - MAP READING, GRAPHS AND REFERENCES
Comparison of Means two at a time

SCHOOLS								
IPI				NON - IPI				
N	School 1	N	School 2	N	School 3	N	School 4	F Ratio
87	55.723	55	62.099	128	67.857	67	59.432	10.181

Table 11a - A comparison between the IPI and non-IPI schools on this variable shows no significant difference. The null hypothesis of no difference can, therefore, not be rejected. However, the relatively high F ratio justifies another hard look at the means which indicate a discernable difference in favor of the non-IPI schools.

C. ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 12
IOWA ARITHMETIC CONCEPT

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	625.692	3	208.564	4.200 **
Grade	714.405	1	714.405	14.387 **
Sex	103.328	1	103.328	2.081
I.Q.	1437.784	1	1437.784	28.955 **
School x grade	88.656	3	29.552	.595
School x sex	119.065	3	39.688	.799
School x I.Q.	63.983	3	21.328	.430
Grade x sex	10.387	1	10.387	.209
Grade x I.Q.	86.626	1	86.626	1.745
Sex x I.Q.	94.039	1	94.039	1.894
School x grade x sex	40.421	3	13.474	.271
School x grade x I.Q.	62.095	3	20.698	.417
School x sex x I.Q.	303.374	3	101.125	2.037
Grade x sex x I.Q.	19.756	1	19.756	.398
School x grade x sex x I.Q.	91.710	3	30.570	.616
Total	15343.416	309	49.655	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 12 - The analysis of variance table shows significant differences at school, grade, and I.Q. levels with fifth grades performing better than fourth and high I.Q. groups performing better than low I.Q. groups. There are no significant interactions on the arithmetic concept variable.

TABLE 12a

IOWA ARITHMETIC CONCEPT
Comparison of Means two at a time

SCHOOLS								
IPI				NON - IPI				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL ;	F RATIO
87	21.237	57	23.108	128	25.626	70	22.34	10.412

Table 12a - A comparison of means between IPI and non-IPI schools shows no significant differences. The null hypothesis of no difference cannot, therefore, be rejected. However, the relatively high F ratio discloses a tendency in favor of the non-IPI schools.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 13
IOWA PROBLEM SOLVING

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	683.426	3	227.809	6.603 **
Grade	5.386	1	5.386	.156
Sex	58.268	1	58.268	1.689
I.Q.	430.90	1	430.90	12.492 **
School x grade	38.078	3	12.693	.368
School x sex	115.934	3	38.645	1.120
School x I.Q.	15.285	3	5.095	.148
Grade x sex	.136	1	.136	0.004
Grade x I.Q.	52.292	1	52.292	1.516
Sex x I.Q.	117.550	1	117.550	3.407
School x grade x sex	6.805	3	2.268	.066
School x grade x I.Q.	8.904	3	2.968	.086
School x sex x I.Q.	236.765	3	78.922	2.288
Grade x sex x I.Q.	48.127	1	48.127	1.395
School x grade x sex x I.Q.	77.622	3	25.874	.75
Total	10660.481	309	34.500	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 13 - The analysis of variance table of the problem solving variable discloses a very significant difference between the schools. The school F ratio is much higher on this variable than in the cases discussed before. In addition there is a significant difference between the I.Q. levels with the high I.Q. groups performing significantly better than the low I.Q. groups.

TABLE 13a IOWA PROBLEM SOLVING

SCHOOLS								
IPI				NON - IPI				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	12.14	57	14.092	128	16.736	70	15.309	26.670

Table 13a - A comparison of means between IPI and non-IPI schools shows no significant differences. The null hypothesis of no differences cannot, therefore, be rejected. However, as has already been indicated, the Scheffe test which has been applied is considered extremely conservative. Therefore, the unusually high F ratio of 26.67 deserves special attention. Compared with the other results so far discussed there is a very strong tendency in favor of the non-IPI schools as measured by the problem solving variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 14
IOWA TOTAL - ARITHMETIC

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	2191.84	3	730.613	5.353 **
Grade	511.608	1	511.608	3.748
Sex	383.664	1	383.664	2.811
I.Q.	3656.299	1	3656.299	26.788 **
School x grade	250.668	3	83.556	.612
School x sex	506.059	3	168.686	1.236
School x I.Q.	56.356	3	18.785	.138
Grade x sex	3.248	1	3.248	.024
Grade x I.Q.	335.898	1	335.898	2.461
Sex x I.Q.	351.581	1	351.581	2.576
School x grade x sex	64.982	3	21.661	.159
School x grade x I.Q.	58.618	3	19.539	.143
School x sex x I.Q.	1145.233	3	381.744	2.797 *
Grade x sex x I.Q.	92.030	1	92.030	.674
School x grade x sex x I.Q.	300.995	3	100.332	.735
Total	42175.227	309	136.489	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 14 - The total arithmetic score is the mean of the arithmetic concept and problem solving scores. The analysis of variance table discloses a significant difference at school and I.Q. levels as well as significant interaction of school x sex x I.Q.

TABLE 14a

IOWA TOTAL - ARITHMETIC
Comparison of Means two at a time

SCHOOLS								
IPI				NON- IPI				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
	33.878		37.2		41.901		37.659	18.564

Table 14a - The comparison of means between IPI and non-IPI schools shows no significant differences. The null hypothesis of no difference can, therefore, not be rejected. However, the relatively very high F ratio shows a substantial advantage of the non-IPI schools over the IPI schools on the total arithmetic score as measured by the Iowa Test of Basic Skills.

TABLE 14b IOWA TOTAL - ARITHMETIC
Comparison of Means two at a time

		SCHOOLS								
		IPI				NON - IPI				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	39.8	10	41.5	34	46.7	16	47.6	4.697
M	H	26	35.4	11	41	47	43.6	11	36.7	4.425
F	L	28	32.9	20	31.2	16	41.4	24	29.3	0.594
M	L	20	25.4	6	40	31	35.9	19	37	2.945

Table 14b - The significant interaction effect which comprises the school factor requires a modifying statement.

A comparison of IPI and non-IPI schools at all levels of intelligence and sexes discloses no significant differences. However, the relatively high F ratio at the high girls level shows, after a scrutiny of the means, an advantage in favor of non-IPI schools. With regard to the high boys, the means do not disclose a distinct pattern.

With regard to low boys and low girls within the schools, one IPI school and one non-IPI school show an advantage in favor of the former - the other IPI and non-IPI school show a reverse pattern.

SUMMARY OF THE IOWA TEST OF BASIC SKILLS

The analysis of the Iowa Test of Basic Skills does not disclose any significant differences between IPI and non-IPI students on any of the fourteen variables. Theoretically, therefore, differences must be attributed to the heterogeneity of the sample rather than to a specific school program. It also can be maintained that the IPI schools do not differ from the non-IPI schools when measured by the Iowa Test of Basic Skills. However, this theoretical rigidity as imposed by the Scheffe method, should not obliterate certain consistent trends which are important in spite of the lack of statistical significance.

1) The analysis showed that in nine out of fourteen variables the non-IPI schools, or segments thereof, showed a consistent advantage over the IPI schools.
2) These advantages manifested themselves mainly in the reference and mathematical skills. In the language area the differences were relatively slight and/or few. This is demonstrated by the analysis of the total language score which showed no difference between schools.
3) It seems that certain groups of students are positively or negatively affected when measured on the Iowa Test. Girls of the high intelligence groups,as defined in this project,tend to succeed more in non-IPI settings. To a less degree and with less consistency, the reverse can be said about the high intelligence boy groups.
4) The four factor interaction analysis showed that the observations described in 3% were mostly confined to the fifth grade groups.
5) One non-IPI school, High Ridge Knolls, differed almost consistently from the other three in terms that its low boys achieved higher results than its low girls. The other schools,almost consistently,followed the established patterns of girls achieving higher results than boys at all levels.
6) As far as could be determined the phenomenon described in 5 was particularly emphasized at the fifth grade level.

D. THE PART-IOWA TEST OF BASIC SKILLS

The analysis of the fourteen following variables is produced to reject the null hypothesis that fourth and fifth graders in IPI settings as provided by School District 59 do not achieve better results as measured by the Part-Iowa Test of Basic Skills. The Part-Iowa Test is composed of those items of the Iowa Test of Basic Skills which, according to the evaluation of the teachers of the tested schools, have been covered by their program.

FOR PRECISE DESCRIPTION OF THE PART-IOWA TEST SEE PAGE 17.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 15
PART-IOWA TEST - VOCABULARY

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	131.529	3	43.843	2.132
Grade	1887.301	1	1887.301	91.774 **
Sex	40.937	1	40.937	1.991
I.Q.	931.420	1	931.420	45.292 **
School x grade	91.757	3	30.586	1.487
School x sex	1.568	3	.523	.025
School x I.Q.	73.897	3	24.632	1.198
Grade x sex	8.292	1	8.292	.403
Grade x I.Q.	138.056	1	138.056	6.713 **
Sex x I.Q.	9.089	1	9.089	.442
School x grade x sex	16.581	3	5.527	.269
School x grade x I.Q.	13.068	3	4.356	.212
School x sex x I.Q.	126.963	3	42.321	2.058
Grade x sex x I.Q.	2.042	1	2.042	.099
School x grade x sex x I.Q.	182.815	3	60.938	2.963 *
Total	6375.048	310	20.565	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 15 - It has been established that significant differences on the vocabulary variable are mainly due to grade and I.Q. Namely, that fifth graders perform better than fourth graders and high I.Q.groups perform better than low I.Q. groups. The significant interaction of grade x I.Q. modifies the significance of the main effects. The significant interaction of school x sex x grade x I.Q. shows that the above mentioned differences are, in part, dependent on the other two variables.

TABLE 15a

PART-IOWA TEST - VOCABULARY
Comparison of Means two at a time

			SCHOOLS								
			IPI				NON - IPI				
GRADE	SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	F	H	11	22.5	4	23.7	22	22.6	6	19.8	0.319
5	F	H	3	26.	5	20.8	16	24.4	12	25.1	4.427
4	M	H	15	15.1	7	14.7	25	13.	5	16.4	1.220
5	M	H	10	15.6	5	15.6	18	15.4	4	15.5	0.014
4	F	L	4	13.5	13	14.	13	20.9	13	16.2	10.900
5	F	L	13	17.	4	20.2	7	20	8	14.5	0.182
4	M	L	16	1.4	13	13.4	8	13.	11	12.7	0.245
5	M	L	15	13.1	10	20.2	9	14.1	16	12.9	7.931

Table 15a - The table of comparison between means, two at a time, shows no significant differences between IPI and non-IPI schools at any level. The null hypothesis of no differences can, therefore, not be rejected. However, certain relatively high F ratios should be examined. It seems that the fifth grade high IQ girls in the non-IPI settings tend to achieve better results than their IPI counterparts. The same can be said about the fourth grade low IQ girls. The relatively high F ratio of the low fifth grade boys is largely the result of the relatively high achievement at Grant Wood School, which is an IPI school.

Comparing these results with the results on the same variable on the full Iowa Test,the following observations should be kept in mind. The better performance of the high I.Q. fifth grade girls in the non-IPI settings remains and is even a little more emphasized. The difference of sex performance within the schools d disappears. The girls in all four schools perform better than boys. The better performance of fourth grade low girls in the non-IPI schools is a new factor.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 16
PART-IOWA - READING COMPREHENSION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1710.608	3	570.203	3.821 **
Grade	726.450	1	726.450	4.868 *
Sex	747.793	1	747.793	5.011 *
I.Q.	4234.761	1	4234.761	28.379 **
School x grade	275.123	3	91.708	.615
School x sex	448.065	3	149.355	1.001
School x I.Q.	725.183	3	241.728	1.62
Grade x sex	126.253	1	126.253	.846
Grade x I.Q.	2.223	1	2.223	.015
Sex x I.Q.	17.787	1	17.787	.119
School x grade x sex	197.480	3	65.827	.441
School x grade x I.Q.	104.895	3	34.965	.234
School x sex x I.Q.	1753.586	3	584.529	3.917 **
Grade x sex x I.Q.	17.099	1	17.099	.115
School x grade x sex x I.Q.	967.059	3	322.353	2.160
Total	46258.693	3	149.222	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 16 - Significant differences in achievement on reading comprehension as m measured by the part-Iowa Test is due to differences between schools, differences between grades, differences between sexes as well as differences between I.Q. levels. In addition there is a significant interaction of school x sex x I.Q.

TABLE 16a PART-IOWA - READING COMPREHENSION
Comparison of Means two at a time

	SCHOOLS							
IPI				NON - IPI				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	36.013	57	38.583	128	43.077	70	37.268	8.912

Table 16a - A comparison between means, two at a time,or the school as main effec does not produce a significant F ratio. The null hypothesis of no difference can, therefore, not be rejected. However, the relatively large F ratio hints to the fact that the non-IPI schools tended to produce higher mean averages than the IPI schools.

TABLE 16b PART-IOWA - READING COMPREHENSION

		SCHOOLS								
		IPI				NON - IPI				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	48	10	38.	34	56	16	48.3	10.314
M	H	36	41.6	11	41.9	27	44	11	38.2	0.221
F	L	28	34.6	20	42.	16	43.6	24	27.8	1.856
M	L	26	27.	16	42.	81	34.1	19	34.7	3.217

Table 16b - The breakdown of the interaction does not produce significant results at any level. The null hypothesis of no differences can, therefore, not be rejected. However, the relatively large F ratio of the high girls indicates that the highly intelligent girls in the non-IPI schools showed the tendency to score higher than their counterparts in the IPI schools. The same, but with less assurance, can be said about the low boys; namely that boys of the lower intelligence group in the non-IPI settings achieved higher averages than their counterparts in the IPI schools.

Looking at the differences within the schools themselves, the high girls in the non-IPI schools achieved better results than their male counterparts in the same schools. The reverse is true about the high boys. With regard to the low intelligence groups, High Ridge Knolls stands out in that its boys achieved higher averages than its girls. The reverse is true with regard to the other three schools. All these findings underscore the findings on the Iowa Test.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 17
PART-IOWA - SPELLING

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	240.891	3	80.297	2.326
Grade	323.147	1	323.147	9.359 **
Sex	697.287	1	697.287	20.195 **
I.Q.	718.794	1	718.794	20.817 **
School x Grade	206.213	3	68.738	1.991
School x sex	167.385	3	55.795	1.616
School x I.Q.	165.673	3	55.224	1.599
Grade x sex	17.712	1	17.712	.513
Grade x I.Q.	106.752	1	106.752	3.092
Sex x I.Q.	7.123	1	7.123	.206
School x grade x sex	61.577	3	20.526	.594
School x grade x I.Q.	22.675	3	7.558	.219
School x sex x I.Q.	222.988	3	74.329	2.153
Grade x sex x I.Q.	.302	1	.302	.009
School x grade x sex x I.Q.	84.762	3	28.254	.818
Total	10703.801	310	34.528	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 17 - The analysis of variance table shows significant differences at grade, sex, and I.Q. levels. Compared with the full Iowa Test on the same variable the grade variable has become a discriminating factor, and there are no differences between schools. In other words, the Iowa Test, when the items not covered by the classes were excluded, did not show significant differences between the four schools on the spelling variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 18
PART-IOWA - CAPITALIZATION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	208.050	3	69.350	2.576
Grade	581.374	1	581.374	21.593 **
Sex	349.314	1	349.314	12.974 **
I.Q	848.93	1	848.93	31.531 **
School x grade	82.273	3	27.424	1.019
School x sex	185.416	3	61.805	2.296
School x I.Q.	33.911	3	11.304	.42
Grade x sex	5.305	1	5.305	.197
Grade x I.Q.	16.67	1	16.670	.619
Sex x I.Q.	.043	1	.043	.002
School x grade x sex	115.577	3	38.526	1.431
School x grade x I.Q.	125.428	3	41.809	1.553
School x sex x I.Q.	56.103	3	18.701	.695
Grade x sex x I.Q.	75.557	1	75.557	2.806
School x grade x sex x I.Q.	43.613	3	14.538	.540
Total	8346.204	310	26.923	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 18 - The analysis of variance table shows significant differences at grade, sex, and I.Q. levels. Compared with the original Iowa Test grade as main effect has entered as a discriminating factor. On the other hand, however, differences between schools have disappeared. Therefore, there is reason to believe that after having removed biased items from the test all schools do equally well.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 19
PART-IOWA - PUNCTUATION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	156.834	3	52.278	1.411
Grade	207.397	1	207.397	5.599 *
Sex	461.621	1	461.621	12.461 **
I.Q.	1185.535	1	1185.535	32.003 **
School x grade	166.775	3	55.592	1.501
School x sex	99.165	3	33.055	.892
School x I.Q.	35.917	3	11.972	.323
Grade x sex	17.288	1	17.288	.467
Grade x I.Q.	41.195	1	41.195	1.112
Sex x I.Q.	1.602	1	1.602	.043
School x grade x sex	179.979	3	59.993	1.619
School x grade x I.Q.	107.341	3	35.780	.966
School x sex x I.Q.	101.770	3	33.923	.916
Grade x sex x I.Q.	.008	1	.008	.000
School x grade x sex x I.Q.	103.915	3	34.638	.935
Total	11483.606	310	37.044	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 19 - The analysis of variance of the punctuation variable shows significant differences on the grade, sex, and I.Q. levels. As is the case of the full Iowa Test of Basic Skills there are no significant differences between schools. Contrary to the findings on the same variable when the total Iowa Test was analyzed, the grade factor has become a discriminating main effect.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 20 PART-IOWA - USAGE OF WORDS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	179.855	3	59.952	1.907
Grade	220.887	1	220.887	7.025 **
Sex	81.305	1	81.305	2.586
I.Q.	172.927	1	172.927	5.499 *
School x grade	34.163	3	11.388	.362
School x sex	52.426	3	17.475	.556
School x I.Q.	55.611	3	18.537	.590
Grade x sex	7.816	1	7.816	.249
Grade x I.Q.	.96	1	.96	.030
Sex x I.Q.	19.147	1	19.147	.609
School x grade x sex	56.937	3	18.979	.604
School x grade x I.Q.	92.292	3	30.764	.978
School x sex x I.Q.	48.614	3	16.205	.515
Grade x sex x I.Q.	3.767	1	3.767	.120
School x grade x sex x I.Q.	152.675	3	50.891	1.618
Total	9747.898	310	31.445	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 20 - The analysis of variance table shows significant differences at grade and I.Q. levels. Contrary to the findings on the full Iowa Test of Basic Skills the grade level main effect has become a discriminating factor. On the other hand, there is no significant difference between sexes. As in the case of the full Iowa Test, there is no significant difference between schools.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 21
PART-IOWA - TOTAL LANGUAGE

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1928.474	3	642.825	2.091
Grade	1423.725	1	1423.725	4.632 *
Sex	5951.034	1	5951.034	19.360 **
I.Q.	10985.252	1	10985.252	35.737 **
School x grade	1613.211	3	537.737	1.749
School x sex	1541.579	3	513.860	1.672
School x I.Q.	408.693	3	136.231	.443
Grade x sex	29.823	1	29.823	.097
Grade x I.Q.	567.470	1	567.470	1.846
Sex x I.Q.	44.216	1	44.216	.144
School x grade x sex	1016.831	3	338.944	1.103
School x grade x I.Q.	1205.614	3	401.871	1.307
School x sex x I.Q.	1264.580	3	421.527	1.371
Grade x sex x I.Q.	21.321	1	21.321	.069
School x grade x sex x I.Q.	1131.614	1	377.205	1.227
Total	95290.349	310	307.388	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 21 - The scores compared herewith are the means of the scores analyzed in the previous six tables describing different competencies in the language area. It can be said, in general, that there is no overall difference between the four schools in the language area as measured by the part-Iowa Test. As opposed to the full-Iowa Test, the grade level factor on the part-Iowa has become a discriminating main effect. In addition, as is the case when the full-Iowa was used, sex and I.Q. levels are discriminating factors.

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E. ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 22

PART-IOWA - MAP READING

SOURCE	SUM OF SQUARES	DEGREES. OF FREEDOM	MEAN SQUARE	F RATIO
School	72.010	3	24.003	2.143
Grade	5569.438	1	5569.438	497.199 **
Sex	3.145	1	3.145	.281
I.Q.	200.228	1	200.228	17.875 **
School x grade	6.633	3	2.211	.197
School x sex	31.587	3	10.529	.940
School x I.Q.	18.788	3	6.263	.559
Grade x sex	.037	1	.037	.003
Grade x I.Q.	82.310	1	82.310	7.348 **
Sex x I.Q.	10.077	1	10.077	.9
School x grade x sex	25.426	3	8.475	.757
School x grade x I.Q.	8.058	3	2.686	.24
School x sex x I.Q.	10.352	3	3.451	.308
Grade x sex x I.Q.	.339	1	.339	.03
School x grade x sex x I.Q.	1.701	3	.567	.051
Total	3472.506	310	11.202	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 22 - The analysis of variance table of the part-Iowa Test Map Reading variable shows significant differences at the grade and I.Q. levels as well as a significant interaction of grade x I.Q. Compared with the analysis of the full-Iowa on this variable most differences have disappeared. The interpretation of these changes cannot, in this instance, point to the fact that once materials not covered by the classrooms have been elminated, differences between school settings disappear. It must be remembered that most of the questions with regard to the map reading skill have been deleted from the part-Iowa. In addition, all of the questions for the fourth grade level have been omitted and only 7 out of 36 questions remained for the fifth grade level.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 23
PART-IOWA - REFERENCES

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	975.052	3	325.017	5.737 **
Grade	2078.750	1	2078.750	36.693 **
Sex	934.701	1	934.701	16.499 **
I.Q.	1733.905	1	1733.905	30.606 **
School x grade	277.978	3	92.659	1.636
School x sex	229.37	3	76.457	1.35
School x I.Q.	26.289	3	8.763	.155
Grade x sex	26.247	1	26.247	.463
Grade x I.Q.	158.568	1	158.568	2.799
Sex x I.Q.	.125	1	.125	.002
School x grade x sex	33.557	3	11.186	.197
School x grade x I.Q.	63.277	3	21.092	.372
School x sex x I.Q.	598.141	3	199.380	3.519 *
Grade x sex x I.Q.	.597	1	.597	.010
School x grade x sex x I.Q.	755.443	3	251.814	4.445 **
Total	17562.044	310	56.652	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 23 - The analysis of variance table shows that the school, grade, sex, and I.Q. level are significantly discriminating main effects. These main effects, however, do not operate in isolation as shown by the significant interactions of school x sex x I.Q. and school x grade x sex x I.Q.

TABLE 23a

PART-IOWA - REFERENCES
Comparison of Means two at a time

SCHOOLS								
I. P. I.				NON - I P I				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	23.763	57	27.245	128	29.36	70	25.67	11.818

Table 23a - The comparison of school means, two at a time, indicates no significant differences in achievement on the part-Iowa Test reference skill between IPI and non-IPI schools. However, the relatively large F ratio justifies the observation that the non-IPI schools as a whole tended to perform better on this variable.

TABLE 23b PART-IOWA - REFERENCES

		I. P. I.				NON-I. P. I.				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	28.	10	34	34	34.1	16	32.1	2.2
M	H	26	25.8	11	29.	47	28.9	11	24.9	0.770
F	L	28	25.8	20	25.7	16	29.8	24	21.7	0.257
M	L	26	15.4	16	23.8	37	24.1	19	24.1	12.192

Table 23b - The breakdown of the school x sex x I.Q. interaction revealed no significant difference between IPI and non-IPI schools at any level. The relatively high F ratio at the low boys level shows a tendency of low boys in non-IPI schools to perform better on this skill than their counterparts in the IPI schools. High Ridge Knolls again shows a reverse tendency with regard to a segment of its students when compared with other schools. The low boys at High Ridge Knolls perform better than the low girls in the same school. This trend is reversed in all other three schools.

TABLE 23c PART-IOWA - REFERENCES

			I.P.I.				NON-I.P.I.				
GRADE	SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	F	H	10	26.7	5	26.4	18	29.5	4	25.5	0.742
5	F	H	3	29.3	5	34.4	16	38.7	12	38.7	4.240
4	M	H	15	22.1	7	22.9	25	26.	5	24.2	2.508
5	M	H	11	29.5	4	35.2	22	37.9	6	25.5	3.073
4	F	L	15	25.1	16	20.7	9	25.9	16	21.6	0.024
5	F	L	13	26.4	4	30.7	7	33.7	8	21.7	0.001
4	M	L	16	16.6	13	23.6	18	21.4	11	18.4	0.070
5	M	L	4	14.2	3	24.	13	26.8	8	29.7	8.371

Table 23c - A breakdown of the school by grade, by sex, by I.Q. interaction does not shows any significant difference between IPI and non-IPI schools at any level. It stands out, however, that the differences described by Table 23b are produced mainly at the fifth grade level where low boys in non-IPI schools

Table 23c (cont'd)

tend to perform at higher levels than their counterparts in the IPI settings. By the same token, but to a less degree, fifth grade high girls in non-IPI schools tend to perform at higher levels than their counterparts in IPI schools. The reverse tendency seems to be true with regard to high fifth grade boys who performed at higher levels in the IPI schools. This last observation can be maintained with less certainty than the others.

Another observation accruing from the analysis of the means is noteworthy. High fifth grade girls in the non-IPI schools had a pronounced tendency to achieve at higher levels than their male counterparts in the same schools, whereas, though only to a slight degree, the trend was reversed in the IPI schools. Low boys at the fifth grade level at High Ridge Knolls perform at higher levels than their female counterparts in the same school. This trend is reversed in the other three schools.

Compared with the results of the full-Iowa Test it is interesting to note that the part-Iowa analysis supports earlier observations almost entirely.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 24
PART-IOWA - TOTAL REFERENCE SKILLS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1728.273	3	576.091	5.646 **
Grade	63.12	1	63.12	.619
Sex	889.357	1	889.357	8.717 **
I.Q.	3475.112	1	3475.112	34.061 **
School x grade	303.834	3	101.278	.993
School x sex	462.121	3	154.040	1.51
School x I.Q	89.277	3	29.759	.292
Grade x sex	35.98	1	35.98	.353
Grade x I.Q.	40.194	1	40.194	.394
Sex. x I.Q.	35.992	1	35.992	.353
School x grade x sex	66.077	3	22.026	.216
School x grade x I.Q.	42.077	3	14.026	.137
School x sex x I.Q.	911.815	3	303.938	2.979 *
Grade x sex x I.Q.	19.199	1	19.199	.188
School x grade x sex x I.Q.	923.607	3	307.869	3.018
Total	31628.110	310	102.026	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 24 - The total score is of the map reading and reference skills scores. The analysis of variance table shows significant differences at school, sex, and I.Q. levels. There are two significant interactions, that of school x sex x I.Q., and School x grade x sex x I.Q.

TABLE 24a PART-IOWA - TOTAL REFERENCE SKILLS
Comparison of Means two at a time

I. P. I. SCHOOLS				NON-I. P. I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	34.041	57	39.015	128	41.223	70	36.646	10.619

Table 24a - The comparison of means, two at a time, of the school main effect shows no significant differences in between the IPI and non-IPI schools. However, the relatively large F ratio is the result of a trend favoring the non-IPI schools.

TABLE 24b PART-IOWA - TOTAL REFERENCE SKILLS
Comparison of Means two at a time

		I P I SCHOOLS				NON- I P I SCHOOLS				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	40.5	10	42.8	34	47.	16	45.	3.647
M	H	26	36.9	11	41.7	47	41.8	11	36.4	1.326
F	L	28	35.2	20	35.9	16	40.8	24	30	0.293
M	L	26	23.6	16	35.6	31	35.3	19	35.1	11.130

Table 24b - The breakdown of the school x sex x I.Q. interaction revealed no significant differences at any level. The null hypothesis of no difference can, therefore, not be rejected. However, there is an indication that high girls in the non-IPI schools tend to achieve higher results than their counterparts in the IPI schools. The same may be said about the low boys, however, the difference here is mainly the product of the relatively low achievement of School #1 and the relatively high achievement of School #4. High Ridge Knolls (School 4) continues with its reverse trend to the other three schools in that its low boys achieve better results than its low girls.

TABLE 24c PART-IOWA - TOTAL REFERENCE SKILLS
Comparison of Means two at a time

			I P I SCHOOLS				NON - IPI SCHOOLS				
GRADE	SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	F	H	10	42.3	5	40.8	18	45.2	4	40.7	0.582
5	F	H	3	38.7	5	44.8	16	48.9	12	49.3	2.623 **
4	M	H	15	36.3	7	38.4	25	41.8	5	39.4	2.411
5	M	H	11	37.5	4	45.	22	41.9	6	33.5	0.034
4	F	L	15	36.7	16	32.3	9	39.4	16	32.6	0.051
5	F	L	13	33.7	4	39.5	7	42.1	8	27.4	0.050
4	M	L	16	26.2	13	37.6	18	34.6	11	31.2	0.568
5	M	L	4	21	3	33.7	13	35.9	8	39.	5.823 **

TABLE 24c - This table refines the findings of Table 24b. Again, there are no significant differences at any level. However, relatively high F ratios and the means which produced them indicate that differences expressed in the previous table are located,in the main, at the fifth grade level where the high girls and low boys tend to achieve better results in the non-IPI settings.

When compared with the original Iowa Test results, this part of the Part-Iowa which deals with various aspects of reference skills substantiates earlier findings in spite of many deletions and omissions which would justify some doubts with regard to the reliability of the findings. The total difference between IPI and non-IPI schools is of almost the same proportions in the part-Iowa test as in the full-Iowa test. However, the part-Iowa test indicates that these differences can be mainly attributed to the differences at the fifth grade level between high girls in the IPI and non-IPI schools and low boys in the IPI and non-IPI schools. These observations are consistent with results as indicated earlier.

F. ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 25 PART-IOWA - ARITHMETIC CONCEPTS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	493.946	3	164.649	4.559 **
Grade	436.238	1	436.238	12.078 **
Sex	53.118	1	531.118	1.471
I.Q.	1041.358	1	1041.358	28.832 **
School x grade	45.671	3	15.224	.421
School x sex	69.740	3	23.247	.644
School x I.Q.	28.139	3	9.38	.26
Grade x sex	24.472	1	24.472	.678
Grade x I.Q.	49.905	1	49.905	1.382
Sex x I.Q.	58.9	1	58.9	1.631
School x grade x sex	23.574	3	7.858	.218
School x grade x I.Q.	99.35	3	33.117	.917
School x sex x I.Q.	215.162	3	71.721	1.986
Grade x sex x I.Q.	17.016	1	17.016	.471
School x grade x sex x I.Q.	80.558	3	26.853	.743
Total	11196.717	310	36.118	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 25 - The analysis of variance table shows significant differences at school, grade, and I.Q. levels with fifth grades performing better than fourth grades and high I.Q. groups performing better than low I.Q. groups. There are no significant interactions on the arithmetic concept skill.

TABLE 25a PART=IOWA - ARITHMETIC CONCEPTS
Comparison of Means two at a time

I. P. I. SCHOOLS				NON-I. P. I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	18.108	57	18.872	10.8	27.033	70	19.203	11.463

Table 25a - The comparison between means, two at a time, shows no significant differences between IPI and non-IPI schools. The null hypothesis of no differences can, therefore, not be rejected. However, the relatively large F ratio is primarily the result of a tendency on the part of the non-IPI schools to achieve better results than the IPI schools. This analysis is almost identical with that of the full Iowa Test of the corresponding variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 26
PART-IOWA PROBLEM SOLVING

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	427.938	3	142.646	6.218 **
Grade	282.572	1	282.572	12.318 **
Sex	73.448	1	73.448	3.202
I.Q.	338.204	1	338.204	14.743 **
School x grade	62.059	3	20.686	.902
School x sex	95.841	3	31.947	1.393
School x I.Q.	5.225	3	1.742	.076
Grade x sex	.058	1	.058	.002
Grade x I.Q.	44.988	1	44.988	1.961
Sex x I.Q.	50.845	1	50.845	2.216
School x grade x sex	15.028	3	5.009	.218
School x grade x I.Q.	1.307	3	.436	.019
School x sex x I.Q.	166.038	3	55.346	2.413
Grade x sex x I.Q.	20.841	1	20.841	.908
School x grade x sex x I.Q.	43.747	3	14.582	.636
Total	7111.374	310	22.940	

* F is significant with probability less than .05
** F is singificant with probability less than .01

Table 26 - The analysis of variance table of the Problem Solving Skill as measured by the part-Iowa Test indicates significant differences at schools, grades, and I.Q. levels. The F ratio of school as main effect is relatively high. Compared with the table of the full-Iowa Test, the grade factor has become a significant discriminator.

TABLE 26a PART-IOWA - PROBLEM SOLVING
Comparison of Means two at a time

I. P. I. SCHOOLS				NON-I. P. I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	10.503	57	12.261	128	14.129	70	13.144	24.328

TABLE 26a - A comparison between means, two at a time, shows no significant differences between IPI and non-IPI schools. However, the relatively very large F ratio is produced by a substantial trend of the non-IPI schools to perform better than the IPI schools. When compared with the analysis of the same variable on the full-Iowa Test, the results are almost identical in spite of a small decrease of the F ratio.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 27
PART-IOWA - TOTAL TEST ARITHMETIC

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1587.874	3	529.291	5.227 **
Grade	15.612	1	15.612	.154
Sex	223.36	1	223.367	2.206
I.Q.	2508.934	1	2508.934	24.776 **
School x grade	259.172	3	86.391	.853
School x sex	258.519	3	86.173	.851
School x I.Q.	54.204	3	18.068	.178
Grade x sex	63.4	1	63.4	.626
Grade x I.Q.	103.512	1	103.512	1.022
Sex x I.Q.	251.958	1	251.958	2.488
School x grade x sex	78.318	3	26.106	.258
School x grade x I.Q.	52.244	3	17.415	.172
School x sex x I.Q.	712.161	3	237.387	2.344
Grade x sex x I.Q.	68.905	1	68.905	.68
School x grade x sex x I.Q.	197.224	3	65.741	.649
Total	31391.631	310	101.263	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 27 - The total arithmetic score is the mean of the arithmetic concept skills and the problem solving skills scores. The analysis of variance table shows significant differences at school and I.Q. levels. Contrary to findings on the full-Iowa Test there are no significant interactions.

TABLE 27a

PART-IOWA - TOTAL TEST ARITHMETIC
Comparison of Means two at a time

I. P. I. SCHOOLS				NON-I. P. I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	28.923	57	32.062	128	32.308	70	32.110	3.539

TOTAL 27a - The comparison of means, two at a time, shows no significant differences between IPI schools and non-IPI schools. The relatively small F ratio is the result of a slight tendency of the non-IPI schools to obtain better results than the IPI schools. However, when compared with findings on the full-Iowa Test, the part-Iowa Test shows a tendency toward the reduction of these differences. The very insignificant F ratio is primarily a result of the differences between the scores of School #1 (Brentwood) and school #4 (High Ridge Knolls).

SUMMARY OF THE PART-IOWA TEST OF BASIC SKILLS

Thirteen out of fourteen scores of the full-Iowa Test were converted into part-Iowa Test scores and analyzed. The analyses of the part-Iowa Test shows no significant differences between IPI and non-IPI students. Theoretically, therefore, it must be maintained that IPI students in School District 59 do not differ from non-IPI students in the same District when measured on those items of the Iowa Test which, according to the testimony of their teachers, relate to their school programs. However, in spite of this rigid theoretical statement which is the result of a very conservative analysis, there is ample justification to observe certain trends.

1. Non-IPI students had an advantage over IPI students on 7 out of 13 variables.
2. The advantages of the non-IPI groups manifested themselves primarily in the area of reference and mathematical skills.
3. Compared with the full-Iowa Test, the number of variables where trends of differences appeared to favor the non-IPI schools were reduced, primarily in the language area.
4. The variables which showed differences between schools when measured on the full-Iowa Test, but ceased to do so when the part-Iowa Test was applied were primarily in the language area.
5. The differences in the reference skills area increased. Although this increase follows a pattern established by the full-Iowa Test there is some reason to doubt the accuracy of measurement because of the drastic elimination of test items.

6. When compared to the full-Iowa Test, the arithmetic results on the part-Iowa Test sharply reduced the differences between IPI and non-IPI schools, although the latter still maintain their tendency for better performance, particularly in the problem-solving area.
7. Because of the reduction of items the grade level main effect has entered, in many cases, as a discriminating factor in the part-Iowa Test. This, in addition to the changes which have occurred in the reference skills, indicates that the item elimination process per se, does not automatically lead to the reduction of differences.
8. The fact that certain student groups are affected more than others stands out in the part-Iowa Test results more clearly. This analysis concurs with the findings on the full-Iowa Test that the high intelligence girls group in non-IPI settings tends, in many instances, to achieve higher scores than its IPI counterpart. It also stands to reason to believe that this phenomenon manifests itself primarily at the fifth grade level.
9. The superiority of the low intelligence boys group in non-IPI groups over its counterpart in the IPI schools, particularly at the fifth grade level, remains to be suggestive. However, it stands to reason that this is created primarily by the differences in achievement between that group in Brentwood and High Ridge Knolls schools.
10. The High Ridge Knolls low boys, primarily at the fifth grade level, tended to achieve higher scores than their feminine counterparts in the same school. The same trend is reversed in all other three schools. This observation may partly explain the phenomenon described in the previous paragraph.

G. ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 28 WRITING SAMPLE - SPELLING

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	5253.077	3	1751.026	3.535 *
Grade	173.481	1	173.481	.35
Sex	6330.8	1	6330.8	12.782 **
I.Q.	6889.892	1	6889.892	13.911 **
School x grade	1481.314	3	493.771	.997
School x sex	3611.394	3	1203.798	2.43
School x I.Q.	279.759	3	93.253	.188
Grade x sex	38.731	1	38.731	.078
Grade x I.Q.	85.748	1	85.748	.173
Sex x I.Q.	1.385	1	1.385	.003
School x grade x sex	2273.343	3	757.781	1.53
School x grade x I.Q.	967.293	3	322.431	.651
School x sex x I.Q.	432.676	3	144.225	.291
Grade x sex x I.Q.	2.646	1	2.646	.005
School x grade x sex x I.Q.	379.940	3	126.647	.256
Total	142646.67	288	495.301	

* F is significant with probability less than .05
** F is significant with probability less than .01

WRITING SAMPLE - The analysis of the writing sample is produced to reject the null hypothesis that independent judges cannot discriminate between IPI and non-IPI students on an independent task performance in the area of language.

Table 28 - The performance on spelling as produced on a free writing sample as perceived by 4 independent judges significantly discriminates between schools, sexes, and I.Q. levels. There are no significant interactions.

TABLE 28a WRITING SAMPLE - SPELLING
Comparison of Means two at a time

I. P. I. SCHOOLS				NON-I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
74	67.938	53	77.648	126	67.496	67	64.268	4.875

Table 28a - A comparison between IPI and non-IPI schools on the spelling variable did not produce a significant difference. The null hypothesis of no difference can, therefore, not be rejected. However, a crude comparison between the means discloses a consistent tendency on the part of the IPI students to achieve better results than their non-IPI counterparts when measured on this variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 29
WRITING SAMPLE - STYLE

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	3412.965	3	1137.655	2.513
Grade	3616.395	1	3616.395	7.988 **
Sex	3003.984	1	3003.984	6.635 **
I.Q.	4181.899	1	4181.899	9.237 **
School x grade	90.475	3	30.158	.067
School x sex	6150.437	3	2050.146	4.529 **
School x I.Q.	1027.227	3	342.409	.756
Grade x sex	10.572	1	10.572	.023
Grade x I.Q.	88.617	1	88.617	.196
Sex x I.Q.	22.953	1	22.953	.051
School x grade x sex	517.294	3	172.431	.381
School x grade x I.Q.	1711.122	3	570.374	1.26
School x wex x I.Q.	902.458	3	300.819	.664
Grade x sex x I.Q.	.081	1	.081	.000
School x grade x sex x I.Q.	283.422	3	94.474	.209
Total	130381.8	288	452.715	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 29 - The analysis of variance table reveals significant differences between grade, sex, and I.Q. levels. There is no significant difference between schools on style, however, school and sex interact significantly.

TABLE 29a

WRITING SAMPLE - STYLE
Comparison of Means two at a time

	I. P. I. SCHOOLS				NON- I.P.I. SCHOOLS				
SEX	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	26	61.6	12	67.3	58	66.8	33	72.9	1.801
M	48	58.6	39	73.1	68	57.7	34	48.3	11.076

Table 29a - A comparison of means, two at a time, broken down by school and sex reveals no significant difference between IPI and non-IPI schools at any level. However, the relatively high F ratio of boys deserves special notion. The means disclose a distinct tendency of boys to achieve higher results when judged by style in the IPI schools than in the non-IPI boys. With regard to girls, results are inconclusive.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 30
WRITING SAMPLE - ORIGINALITY

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1651.981	3	550.66	1.411
Grade	2735.741	1	2735.741	7.012 **
Sex	1872.234	1	1872.234	4.799 *
I.Q.	1031.799	1	1031.799	2.645
School x grade	938.236	3	312.745	.802
School x sex	1491.132	3	497.044	1.274
School x I.Q.	940.218	3	313.406	.803
Grade x sex	160.619	1	160.619	.412
Grade x I.Q.	92.391	1	92.391	.237
Sex x I.Q.	208.443	1	208.443	.534
School x grade x sex	1256.475	3	418.825	1.074
School x grade x I.Q.	1393.194	3	464.398	1.190
School x sex x I.Q.	538.002	3	179.334	.46
Grade x sex x I.Q.	47.645	1	47.645	.122
School x grade x sex x I.Q.	713.15	3	237.717	.609
Total	112358.16	288	390.133	

* F is significant with probability less than .05

** F is significant with probability less than .01

Table 30 - The analysis of variance table on originality as perceived by independent judges discriminates significantly at grade and sex levels. There is, however, no significant differences between schools. It can, therefore, be said that independent judges could not discriminate between IPI and non-IPI in- students when measured on the originality criterion. By the same token, the terpretation may be extended to the students themselves, to the effect that all the groups tested performed equally well on originality.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 31
WRITING SAMPLE - HANDWRITING

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	6188.201	3	2062.734	3.921 *
Grade	1311.584	1	1311.584	2.493
Sex	7051.468	1	7051.468	13.405 **
I.Q.	1319.929	1	1319.929	2.509
School x grade	834.844	3	278.281	.529
School x sex	3392.062	3	1130.687	2.149
School x I.Q.	2536.664	3	845.555	1.607
Grade * sex	2.271	1	2.271	.004
Grade x I.Q.	3.985	1	3.985	.008
Sex x I.Q.	344.649	1	344.649	.655
School x grade x sex	1011.405	3	337.135	.641
School x grade x I.Q.	4541.086	3	1513.695	2.878 *
School x sex x I.Q.	375.658	3	125.219	.238
Grade x sex x I.Q.	35.213	1	35.213	.067
School x grade x sex x I.Q.	868.779	3	289.593	.551
Total	151495.29	288	526.025	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 31 - The analysis of variance table reveals significant differences at school and sex levels. There is a significant interaction of school x grade x I.Q.

TABLE 31a

WRITING SAMPLE - HANDWRITING
Comparison of Means two at a time

I. P. I. SCHOOLS				NON-I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
74	52.221	53	67.438	126	58.459	67	58.217	0.005

Table 31a - A comparison between IPI and non-IPI schools in the handwriting variable as evaluated by independent judges reveals no significant differences between IPI and non-IPI schools. The null hypothesis of no difference can, therefore, not be rejected. The relatively high achievement of the Grant Wood School students is noteworthy.

TABLE 31b

WRITING SAMPLE - HANDWRITING

Comparison of Means two at a time

		I. P. I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	H	21	50.2	11	62.5	12	58.5	8	65.8	1.555
5	H	2	48.8	8	8.6	38	66.2	18	54.8	0.036
4	L	26	53.	28	63.1	26	47.8	26	49.9	3.542
5	L	14	57.	6	58.2	19	59.3	15	62.4	0.261

Table 31b - A comparison between IPI and non-IPI schools when broken down by grade and I.Q. levels produced no significant differences at any level. The null hypothesis of no differences can, therefore, not be rejected. However, a relative advantage of the low fourth graders in IPI schools over their counterparts in the non-IPI schools is noteworthy. This advantage disappears at the fifth grade level. Handwriting is a most difficult factor to evaluate. This fact is brought forth by the rather confusing evidence in this table which is quite distinct from other consistent observations. It seems that the Grant Wood fifth graders have been exposed to circumstances which have strengthened them considerably in the area of handwriting. Such observation, in the opinion of the writer, should be attributed to a specific classroom setting rather than to a program.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 32
WRITING SAMPLE TOTAL

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	3752.105	3	1250.702	3.59 *
Grade	2647.096	1	2647.096	7.598 **
Sex	1709.909	1	1709.909	4.908 *
I.Q.	2850.255	1	2850.255	8.181 **
School x grade	379.308	3	126.436	.363
School x sex	3350.186	3	1116.729	3.205 *
School x I.Q.	795.740	3	265.247	.761
Grade x sex	95.808	1	95.808	.275
Grade x I.Q.	56.423	1	56.423	.162
Sex x I.Q.	18.225	1	18.225	.052
School x grade x sex	496.529	3	165.510	.475
School x grade x I.Q.	2677.395	3	892.465	2.561
School x sex x I.Q.	98.729	3	32.909	.094
Grade x sex x I.Q.	66.361	1	66.361	.19
School x grade x sex x I.Q.	97.233	3	32.411	.093
Total	100341.98	288	348.41	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 32 - The total score as applied here is an independent evaluation and not the mean of the other four scores of the writing sample. The analysis of variance table reveals significant differences at school, grade, sex, and I.Q. levels. There is also a significant interaction of school x sex. These results indicate that the judges were able to discriminate between grade levels with the upper levels achieving better results than the lower levels. They discriminated between sexes with girls performing better than boys and they also discriminated between I.Q. levels with the upper groups performing better than the lower groups. These factors are some indication of the accuracy and competence of the professional people employed in the performance of the evaluation tasks.

TABLE 32a

WRITING SAMPLE TOTAL

Comparison of Means two at a time

I. P. I. SCHOOLS				NON--I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
74	60.797	53	72.630	126	65.316	67	66.77	0.001

Table 32a - The comparison between IPI and non-IPI schools reveals no significant difference in achievement on the total writing sample. The null hypothesis of no difference can, therefore, not be rejected. The superior achievement of the Grant Wood School children is still maintained.

TABLE 32b

WRITING SAMPLE TOTAL

Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
SEX	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
M	48	60.279	39	74.592	68	61.077	34	58.149	5.311
F	26	61.315	14	70.607	58	69.556	33	75.373	3.627

Table 32b - A breakdown of the students according to sex reveals no significant differences between IPI and non-IPI schools at any level. The null hypothesis of no difference can, therefore, not be rejected. The relatively high F ratio of the male group, however, is the result of a tendency on the part of the IPI boys to achieve higher scores than their non-IPI counterparts. The relatively high average of Grant Wood School has considerably influenced this outcome. There are some indications of a reverse trend in the female groups established mainly by the fact that High Ridge Knolls girls have achieved a higher average than Brentwood girls.

SUMMARY

The comparison of IPI and non-IPI schools on an independent language task as measured by the writing sample did not reveal significant differences between the former and the latter in either whole or partial analyses.

Trends identified by various Iowa Tests and part-Iowa Tests analyses were only partially upheld. Although schools, grade levels, sexes, and I.Q. levels were discriminated between on most occasions, this discrimination lost its statistical significance when the sample was grouped into IPI and non-IPI units. The small F ratios in most cases imply an overlap of results.

A trend maintained in two out of five measurements is noteworthy. It appears that boys are more prone to manifest their linguistic skills with greater competence in an IPI school. The results do not indicate a clear and consistent trend with respect to girls. However, there is some justification to hypothesize that girls in non-IPI settings would do better than their IPI counterparts. In the light of the extremely good performance of the Grant Wood School students it is advised to exercise utmost caution before arriving at far reaching conclusions denoting a program rather than unique institutional characteristics as being accountable for differences.

As a whole, the results of the writing sample are consistent with both Iowa Test and part-Iowa Test results which imply a remarkable likeness in the area of language skills between IPI and non-IPI schools as opposed to mathematical and reference skills. The breakdown into sub-groups is not as clear and refined as in the other measurements. This is partly accounted for by the crudeness of the writing sample instrument and the methods of scoring. However, sub-trends, as far as they could be identified in the writing sample, are not inconsistent with earlier findings.

IPI ENGLISH TEST

The IPI English Test was given to test the effect of familiarity with content on the IPI students when compared with non-IPI groups. It was expected to balance alleged advantages of non-IPI classrooms under nationally normatized test conditions by using test materials giving the IPI students the advantage of familiarity.

H. ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE #33 ENGLISH PHONETICS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	3.981	3	1.327	.405
Grade	24.585	1	24.585	7.498 **
Sex	7.640	1	7.640	2.33
I.Q.	97.303	1	97.303	29.674 **
School x grade	12.613	3	4.204	1.282
School x sex	4.845	3	1.615	.493
School x I.Q.	16.536	3	5.512	1.681
Grade x sex	.147	1	.147	.045
Grade x I.Q.	1.935	1	1.935	.59
Sex x I.Q.	1.728	1	1.728	.527
School x grade x sex	2.133	3	.711	.217
School x grade x I.Q.	16.125	3	5.375	1.639
School x sex x I.Q.	8.643	3	2.881	.879
Grade x sex x I.Q.	.049	1	.049	.015
School x grade x sex x I.Q.	.159	3	.053	.016
Total	1016.512	310	3.279	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 33 - The analysis of variance of phonetics shows significant differences at grade and I.Q. levels. There are no significant differences between schools and there are no significant interactions on this variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 34
IPI ENGLISH STRUCTURE

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	40.069	3	13.356	4.569 *
Grade	29,67	1	29.67	10.150 **
Sex	24.914	1	24.914	8.523 **
I.Q.	67.282	1	67.282	23.017 **
School x grade	24.385	3	8.128	2.781 *
School x sex	2.017	3	.67]	.23
School x I.Q.	4.781	3	1.594	.545
Grade x sex	5.601	1	5.601	1.916
Grade x I.Q.	.913	1	.913	.312
Sex x I.Q.	1.264	1	1.264	.432
School x grade x sex	6 668	3	2.223	.760
School x grade x I.Q.	4.357	3	1.452	.497
School x sex x I.Q.	9.304	3	3.101	1.061
Grade x sex x I.Q.	.169	1	.169	.058
School x grade x sex x I.Q.	12.833	3	4.278	1.463
Total	906.163	310	2.923	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 34 - The analysis of variance of the English structure variable shows significant differences at school, grade, sex, and I.Q. levels. An interaction of school x grade is also significant.

TABLE 34a

IPI ENGLISH STRUCTURE
Comparison of Means two at a time

IPI SCHOOLS				NON-IPI SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	5.571	57	5.411	128	5.200	70	4.502	8.970

Table 34a - A comparison of means, two at a time, between IPI and non-IPI schools produces no significant differences. The null hypothesis of no difference can, therefore, not be rejected. The means, however, indicate that the IPI schools have a slight advantage over the non-IPI schools.

TABLE 34b

IPI ENGLISH STRUCTURE
Comparison of Means two at a time

	IPI SCHOOLS				NON-IPI SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	2.53	41	3.21	70	2.91	36	3.10	0.648
5	31	3.94	16	3.44	58	3.52	34	3.12	2.616

Table 34b - The comparison between means when broken down by schools and grades shows no significant differences between IPI and non-IPI schools at any level. The null hypothesis of no difference can, therefore, not be rejected.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 35
IPI ENGLISH VOCABULARY

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1.4	3	.467	.243
Grade	19.131	1	19.131	9.945 **
Sex	17.458	1	17.458	9.075 **
I.Q.	80.415	1	80.415	41.801 **
School x grade	16.659	3	5.553	2.886 *
School x sex	8.988	3	2.996	1.557
School x I.Q.	.622	3	.207	.108
Grade x sex	.001	1	.001	.001
Grade x I.Q.	.013	1	.013	.007
Sex x I.Q.	1.144	1	1.144	.594
School x grade x sex	1.287	3	.429	.223
School x grade x I.Q.	2.970	3	.99	.515
School x sex x I.Q.	13.209	3	4.403	2.289
Grade x sex x I.Q.	.9	1	.9	.468
School x grade x sex x I/Q.	12.355	3	4.118	2.141
Total	596.363	310	1.924	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 35 - The analysis of variance of the vocabulary variable indicates significant differences at school, grade, sex, and I. Q. levels and a significant, school x grade interaction. Schools do not differ significantly. It is noteworthy that these results concur to a large degree with the findings on the same variable in the Iowa Test and part-Iowa Test which were almost identical.

TABLE 35a

IPI ENGLISH VOCABULARY
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-IPI SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	2.53	41	3.21	70	2.91	36	3.10	0.648
5	31	3.94	16	3.44	58	3.52	34	3.12	2.616

Table 35a - The comparison of means, two at a time, when broken down by schools and grades shows no significant differences at any levels between IPI and non-IPI schools. The null hypothesis of no difference can, therefore, not be rejected.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 36
IPI ENGLISH COMPREHENSION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	8.687	3	2.896	.236
Grade	49.000	1	49.000	3.992 *
Sex	123.412	1	123.412	10.055 **
I.Q.	275.044	1	275.044	22.409 **
School x grade	43.777	3	14.592	1.189
School x sex	74.935	3	24.978	2.035
School x I.Q.	11.688	3	3.896	.317
Grade x sex	41.595	1	41.595	3.389
Grade x I.Q.	.155	1	.155	.013
Sex x I.Q.	.962	1	.962	.068
School x grade x sex	11.759	3	3.920	.319
School x grade x I.Q.	14.420	3	4.807	.392
School x sex x I.Q.	142.221	3	47.407	3.862 **
Grade x sex x I.Q.	1.049	1	1.049	.085
School x grade x sex x I.Q.	82.271	3	27.424	2.234
Total	3804.877	310	12.274	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 36 - The analysis of variance of the comprehension variable shows significant differences at grade, sex, and I.Q. levels. The table also shows a significant interaction of school x sex x I.Q.

TABLE 36a IPI ENGLISH COMPREHENSION

Comparison of Means two at a time

		I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	10.1	10	8.2	34	10.5	16	12.	3.744
M	H	26	8.41	11	.10	47	8.99	11	7.05	0.123
F	L	13	8.81	20	8.06	16	8.26	24	6.53	2.896
M	L	20	5.72	26	7.02	31	6.78	19	6.90	0.200

Table 36a - A comparison of means, two at a time, broken down by school, sex and I.Q. levels indicates no significant differences between IPI and non-IPI schools at any level. However, notice should be taken of certain trends. A scrutiny of means adjacent to the highest F ratio discloses an advantage of the high intelligence group of girls in non-IPI settings over their counterparts in the IPI schools. Although the most differences are attributed to intelligence, sex and grade levels, it is still noteworthy that this partial advantage of the non-IPI schools over the IPI schools, concurs with the principal findings of the Iowa Test and part-Iowa Tests on the same variable.

This table also concurs with another phenomenon discussed earlier, namely that the High Ridge Knolls low boys tended to attain better scores than the low girls in the same school, whereas the situation is reversed in all other three schools. A similar observation is made with regard to Grant Wood high boys who have scored higher than the high girls in the same school. This phenomenon is reversed in the other three schools.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 37
IPI ENGLISH LIBRARY SKILL

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	6.817	3	2.272	.712
Grade	31.075	1	31.075	9.735 **
Sex	75.716	1	75.716	23.718 **
I.Q.	105.106	1	105.106	32.925 **
School x grade	32.424	3	10.808	3.386 *
School x sex	11.209	3	3.736	1.170
School x I.Q.	14.349	3	4.783	1.498
Grade x sex	.065	1	.065	.02
Grade x I.Q.	7.131	1	7.131	2.234
Sex x I.Q.	5.559	1	5.559	1.741
School x grade x sex	12,454	3	4.151	1.3
School x grade x I.Q.	22.461	3	7.487	2.345
School x sex x I.Q.	19.322	3	6.441	2.018
Grade x sex x I.Q.	.227	1	.227	.071
School x grade x sex x I.Q.	27.028	3	9.009	2.822 *
Total	989.605	310	3.192	

*F is significant with probability less than .05
**F is significant with probability less than .01

Table 37 - The analysis of variance of the library skill shows significant differences at grade, sex, and I.Q. levels. There are also significant interactions of school x grade and school x grade x sex x I.Q.

TABLE 37a

IPI ENGLISH LIBRARY SKILL
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	3.6	41	3.86	70	4.18	36	4.38	4.661
5	31	5.44	16	4.4	50	4.88	34	4.18	2.128

Table 37a - A comparison of means, two at a time, when broken down by schools and grades shows no significant differences at any level between IPI and non-IPI schools. At the fourth grade level, however, the non-IPI students have a slight advantage over their IPI counterparts. This trend, however, disappears at the fifth grade level.

TABLE 37b

IPI ENGLISH LIBRARY SKILL
Comparison of Means two at a time

			I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	F	H	10	5.2	5	4.6	18	4.83	4	6.25	0.019
5	F	H	3	7	5	6	16	5.67	12	6.33	0.327
4	M	H	15	2.53	7	3.57	25	4.16	5	4.8	7.872
5	M	H	11	5.3	4	5.75	22	4.84	6	3.5	2.389
4	F	L	15	4.40	16	3.44	9	4.11	16	3.56	0.091
5	F	L	13	5.15	4	4.5	7	4.86	8	2.87	3.601
4	M	L	16	2.25	13	3.35	18	3.61	11	2.91	0.645
5	M	L	4	4.25	3	1.33	13	4.15	8	4.	1.967

TABLE 37b - The comparison of means, two at a time, when broken down by schools, grades, sexes and I.Q. levels, indicates no significant differences between IPI and non-IPI schools at any level. The null hypothesis of no difference can, therefore, not be rejected.

Certain trends, although statistically not significant, are noteworthy. Fourth grade high boys in the non-IPI schools tended to score higher than their counterparts in IPI schools. This trend seems to reverse itself at the fifth grade level. The fifth grade low boys at High Ridge Knolls tend to continue attaining better score average than low fifth grade girls in the same school, whereas this trend is reversed in all other three schools.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 38
ENGLISH REFERENCE

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	4.203	3	1.401	.507
Grade	30.252	1	30.252	10.939 **
Sex	18.035	1	18.035	6.521 *
I.Q.	84.532	1	84.532	30.566 **
School x grade	7.035	3	2.345	.848
School x sex	11.144	3	3.715	1.343
School x I.Q.	6.763	3	2.254	.815
Grade x sex	.462	1	.462	.167
Grade x I.Q.	.426	1	.426	.154
Sex x I.Q.	.605	1	.605	.219
School x grade x sex	4.126	3	1.375	.497
School x grade x I.Q.	16.382	3	5.461	1.974
School x sex x I.Q.	12.674	3	4.225	1.528
Grade x sex x I.Q.	.131	1	.131	.047
School x grade x sex x I.Q.	6.234	3	2.078	.751
Total	857.324	310	2.766	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 38 - The analysis of variance of the reference skill shows significant differences at grade, sex and I.Q. levels. There is no significant difference between schools - neither are there any significant interactions at any level.

Comparing these results with the analysis of the Iowa Test and part-Iowa Test in the same area it becomes difficult to escape the notion that the apparent advantage of the non-IPI groups over the IPI groups, as indicated before, is strongly influenced by the content and form of the Iowa Test. On the other hand, the non-IPI students were capable to transfer their skills to an IPI situation to a degree that made even trends toward differences unidentifiable. This is not true under reverse conditions.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 39
IPI ENGLISH TEST - TOTAL

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	104.732	3	34.911	.473
Grade	1073.607	1	1073.607	14.531 **
Sex	1289.015	1	1289.015	17.446 **
I.Q.	3966.071	1	3966.071	53.679 **
School x grade	682.728	3	227.576	3.080 *
School x sex	254.999	3	85.000	1.150
School x I.Q.	84.463	3	28.154	.381
Grade x sex	88.719	1	88.719	1.201
Grade x I.Q.	22.407	1	22.407	.303
Sex x I.Q.	59.492	1	59.492	.805
School x grade x sex	112.764	3	37.588	.509
School x grade x I.Q.	304.577	3	101.526	1.374
School x sex x I.Q.	764.697	3	254.899	3.450 *
Grade x sex x I.Q.	5.139	1	5.139	.069
School x grade x sex x I.Q.	348.340	3	116.113	1.572
Total	22904.299	310	73.885	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 39 - The analysis of variance table of the total English IPI Test shows significant differences at grade, sex, and I.Q. levels. There are significant interactions of school x grade and school x sex x I.Q. These results indicate that the major sources of variance are grades, sex and I.Q. levels.

TABLE 39a

IPI ENGLISH TEST - TOTAL
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	2.63	41	2.9	70	2.83	36	2.944	0.010
5	31	3.52	16	3.22	58	3.35	34	2.9	0.022

TABLE 39b

IPI ENGLISH TEST - TOTAL
Comparison of Means two at a time

		I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	3.76	10	3,42	34	3.72	18	4.	0.008
M	H	26	3.14	11	3.45	47	3.1	11	2.86	0.009
F	L	28	3.11	20	3.42	16	3.00	24	2.28	0.132
M	L	20	2.29	26	2.52	37	2.43	19	2.55	.000

Table 39a and 39b - Both of the above tables, one broken down by school and grade and the other by school, grade and sex, show no significant differences between IPI and non-IPI schools at any level. The F ratios are so small and insignificant that any stipulation with regard to trends cannot be logically justified. Therefore, it must be literally maintained that there is no difference between IPI and non-IPI schools on the total score of the English IPI Test.

SUMMARY - IPI ENGLISH TEST

The analysis of the IPI English Test in its entirety shows similar performance of IPI and non-IPI students. These results concur with earlier findings derived from other instruments.

As in the case of the writing sample, the grade factor has, in many cases, become a discriminating factor which is not surprising since neither the IPI tests nor the writing sample were graded as was the case with the Iowa Test of Basic Skills. It can, therefore, be expected that if grades four and five are given identical tasks, grade five will perform these tasks at higher levels of sophistication.

An earlier observation that fifth grade high girls tend to attain higher scores in non-IPI settings than in IPI schools and that the same in the reverse is true with regard to fifth grade high boys has been upheld only on two separate occasions. All other variables analyzed in this section disclose an overwhelming similarity between IPI and non-IPI schools at all levels.

Certain characteristics of isolated schools observed earlier continue to appear in some of the analyses such as High Ridge Knolls' low boys, particularly at the fifth grade level, attaining higher means than the low girls (particularly at the fifth grade level) in the same school. To a degree , when the variables measured were similar to those covered by the Iowa Test, results were very similar. This observation increases confidence in the reliability of the measurements.

The IPI English Test results concur with earlier findings of little or no difference between the groups in the language area without, however, displaying even slight trends favoring the IPI schools to whose program the test was oriented. The results of language part of the Iowa Test, although by and large identical with observation of an overall no difference between IPI and non-IPI schools, hinted at occasional trends favoring non-IPI groups.

IPI MATHEMATICS TEST

The IPI mathematics test was given to test the effect of familiarity with content on the IPI students when compared with non-IPI students. Whereas the assumption has been that conventional classroom settings were most oriented to the content of a nationally normatized test, such as the Iowa Test of Basic Skills, the expectation leading to the application of an IPI oriented test was the balancing of this alleged disproportion.

I. ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 40
IPI MATHEMATIC NUMERATION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	8.567	3	2.856	2.352
Grade	5.816	1	5.816	4.791 *
Sex	3.358	1	3.358	2.766
I.Q.	24.922	1	24.922	20.529 **
School x grade	13.889	3	4.630	3.814 **
School x sex	.692	3	.231	.190
School x I.Q.	23.007	3	7.669	6.317 *
Grade x sex	.000	1	.000	.000
Grade x I.Q.	2.503	1	2.503	2.062
Sex x I.Q.	2.702	1	2.702	2.226
School x grade x sex	.992	3	.331	.272
School x grade x I.Q.	5.220	3	1.740	1.433
School x sex x I.Q.	3.347	3	1.116	.919
Grade x sex x I.Q.	1.299	1	1.299	1.070
School x grade x sex x I.Q.	2.603	3	.868	.715
Total	367.827	303	1.214	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 40 - The analysis of variance table of the math numeration variable shows significant differences at grades and I.Q. levels. There are also significant interactions of school x grade and school x I.Q. However, with only grades and I.Q. being significant main effects, it can be expected that the school factor, although related to some of the differences, will not be a major source of variation.

TABLE 40a

IPI MATHEMATIC NUMERATION
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON- I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	2.74	39	3.1	70	3.37	35	3.12	6.913
5	31	3.82	16	2.81	56	3.62	32	3.35	0.026

TABLE 40b

IPI MATHEMATIC NUMERATION
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
I.Q.	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
H	56	3.37	39	3.82	70	3.67	35	3.42	0.043
L	37	3.19	16	2.09	56	3.33	32	3.05	4.473

Table 40a and Table 40b - The comparisons between IPI and non-IPI students when broken down by schools x grades and schools x I.Q. levels do not show significant differences at any level of both comparisons. The null hypothesis of no difference can, therefore, not be rejected in either cases.

Table 40a shows that at the fourth grade level the non-IPI schools tended to achieve higher grade point averages than the IPI schools. However, this trend completely disappears at the fifth grade level. The relatively high F ratio of the low students, as indicated in Table 40b, is primarily the result of the relatively low average of one IPI school. In that same school fourth grades have quite uniquely performed better than fifth grades.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 41
IPI MATH PLACE VALUE

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	8.338	3	2.779	2.182
Grade	15.976	1	15.976	12.544 **
Sex	2.679	1	2.679	2.103
I.Q.	32.392	1	32.392	25.434 **
School x grade	36.519	3	12.173	9.558 **
School x sex	2.621	3	.874	.686
School x I.Q.	6.051	3	2.017	1.584
Grade x sex	.266	1	.266	.209
Grade x I.Q.	6.236	1	6.236	4.897 *
Sex x I.Q.	1.814	1	1.814	1.424
School x grade x sex	.544	3	.181	.142
School x grade x I.Q.	3.572	3	1.191	.935
School x sex x I.Q.	4.262	3	1.421	1.116
Grade x sex x I.Q.	6.089	1	6.089	4.781 *
School x grade x sex x I.Q.	4.486	3	1.495	1.174
Total	385.887	303	1.274	

* F is significant with probability less than .05
** F is significant with probability less than .01

TABLE 41 - The analysis of variance of"place value"shows significant differences at the grades and I.Q. levels. There are three significant interactions: School x grade, grade x I.Q., and grade x sex x I.Q. These results indicate that the School factor is only a minor source of variance.

TABLE 41a

IPI MATH PLACE VALUE
Comparison of Means two at a time

GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	2.64	39	3.88	70	3.67	35	3.52	8.840
5	31	4.33	16	3.37	56	4.33	32	3.79	0.390

TABLE 41a - The comparison between IPI and non-IPI schools when broken down by grades shows no significant difference at any level. The null hypothesis of no difference can, therefore, not be rejected. A relatively high F ratio at the fourth grade level implies a slight trend in favor of the non-IPI schools at the fourth grade level. This, however, is mainly due to a relative low achievement average of the fourth graders of one particular IPI school. At the fifth grade level this advantage is not noticeable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 42

IPI MATH - ADDITION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	2.496	3	.832	1.181
Grade	4.339	1	4.339	6.159 *
Sex	.245	1	.245	.348
I.Q.	3.488	1	3.488	4.951 *
School x grade	.955	3	.318	.452
School x sex	1.334	3	.445	.631
School x I.Q.	1.422	3	.474	.673
Grade x sex	.980	1	.980	1.392
Grade x I.Q.	.021	1	.021	.03
Sex x I.Q.	3.978	1	3.978	5.647 *
School x grade x sex	.138	3	.046	.065
School x grade x I.Q.	2.293	3	.764	1.085
School x sex x I.Q.	.157	3	.052	.074
Grade x sex x I.Q.	4.922	1	4.922	6.987 **
School x grade x sex x I.Q.	2.049	3	.683	.969
Total	213.444	303	.704	

* F is significant with probability less than .05

** F is significant with probability less than .01

TABLE 42 - The analysis of variance table of the addition variable shows significant difference at grade and I.Q. levels. The two significant interactions are of sex x I.Q. and grade x sex x I.Q. The school variable does not contribute to a significant difference. Therefore, no difference between IPI and non-IPI schools can be determined on this variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 43
IPI MATH - SUBTRACTION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	4.155	3	1.385	.938
Grade	29.03	1	29.03	19.661 **
Sex	.012	1	.012	.008
I.Q.	13.552	1	13.552	9.178 **
School x grade	11.320	3	3.773	2.556
School x sex	4.365	3	1.455	.985
School x I.Q.	3.581	3	1.194	.808
Grade x sex	.282	1	.282	.191
Grade x I.Q.	.883	1	.883	.598
Sex x I.Q.	.044	1	.044	.03
School x grade x sex	.454	3	.151	.102
School x grade x I.Q.	.85	3	.283	.192
School x sex x I.Q.	2.063	1	.688	.466
Grade x sex x I.Q.	1.131	1	1.131	.766
School x grade x sex x I.Q.	1.690	3	.563	.382
Total	447.399	303	1.477	

* F is significant with probability less than .05
** F is significant with probability less than .01

TABLE 43 - The analysis of variance table of the subtraction variable shows signficant differences at grade and I.Q. levels. The school factor, at any level, has no discriminatory effect. Therefore, IPI and non-IPI schools do not differ on this variable.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 44
IPI MATH - MULTIPLICATION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	36.122	3	12.041	8.515 **
Grade	39.052	1	39.052	27.618 **
Sex	1.294	1	1.294	.915
I.Q.	17.802	1	17.802	12.590 **
School x grade	17.363	3	5.788	4.093 **
School x sex	1.405	3	.468	.331
School x I.Q.	5.078	3	1.693	1.197
Grade x sex	.809	1	.809	.572
Grade x I.Q.	1.066	1	1.066	.754
Sex x I.Q.	.222	1	.222	.157
School x grade x sex	1.041	3	.347	.245
School x grade x I.Q.	1.476	3	.492	.348
School x sex x I.Q.	5.270	3	1.757	1.242
Grade x sex x I.Q.	.245	1	.245	.174
School x grade x sex x I.Q.	2.027	3	.676	.478
Total	428.440	303	1.414	

* F is significant with probability less than .05
** F is significant with probability less than .01

TABLE 44 - The analysis of variance table shows significant difference at school, grade, and I.Q. levels. There is a significant interaction of school x grade.

TABLE 44a

IPI MATH - MULTIPLICATION
Comparison of Means two at a time

I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	3.491	55	3.258	126	4.285	67	3.762	32.187

Table 44a - The comparison of means, two at a time, between IPI and non-IPI schools revealed no significant differences. The null hypothesis of no difference can, therefore, not be rejected. However, the relatively very large F ratio implies a greater than usual tendency on the part of non-IPI students to attain higher scores than the non-IPI students.

TABLE 44b

IPI MATH - MULTIPLICATION
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	4.44	39	2.8	70	4.13	35	3.54	55.814 *
5	31	4.34	16	3.64	56	4.44	32	3.98	0.630

* Significant at less than .25 level

Table 44b - A comparison between means, two at a time, when broken down by schools and grades shows that the fourth graders in non-IPI schools have achieved higher scores on multiplication at less than .25 level of significance, Interestingly enough, at the fifth grade level this advantage is not discernable. The obvious interpretation of this phenomenon is that multiplication in the IPI program as represented by the IPI math test, is covered only at the fifth grade level, whereas in the non-IPI schools this material has already been covered at the fourth grade level. Once taught, the gap between the two school settings disappears completely.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 45
IPI MATH - DIVISION

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	2.474	3	.825	.608
Grade	13.199	1	13.199	9.736 **
Sex	2.082	1	2.082	1.536
I.Q.	12.632	1	12.632	9.318 **
School x grade	11.331	3	3.777	2.786 *
School x sex	1.296	3	.432	.319
School x I.Q.	3.253	3	1.084	.8
Grade x sex	1.621	1	1.621	1.196
Grade x I.Q.	1.903	1	1.903	1.404
Sex x I.Q.	.267	1	.267	.197
School x grade x sex	1.115	3	.372	.274
School x grade x I.Q.	3.111	3	1.037	.765
School x sex x I.Q.	1.617	3	.539	.398
Grade x sex x I.Q.	.845	1	.845	.623
School x grade x sex x I.Q.	3.395	3	1.132	.835
Total	410.750	303	1.356	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 45 - The analysis of variance table shows that there are significant difference at grade and I.Q. levels. There is also a significant interaction of school x grade.

TABLE 45a

IPI MATH - DIVISION
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	3.22	39	3.97	70	3.87	35	3.93	5.038
5	31	4.45	16	4.29	56	4.12	32	4.04	2.162

TABLE 45a - A comparison between means, two at a time, when broken down by schools and grades reveals no significant differences between IPI and non-IPI schools at any level. The null hypothesis of no difference can, therefore, not be rejected. The relatively high F ratio at the fourth grade level is largely due to the relatively low mean of one IPI school. However, at the fifth grade level the same school not only closes the gap, but obtains the highest mean of the four schools. As in multiplication, it may be also assumed here that initial differences are a product of pacing procedures which typify the IPI program rather than an achievement gap.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 46
IPI MATH - COMB. OF PROCESS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	6.857	3	2.286	1.657
Grade	14.867	1	14.867	10.775 **
Sex	.231	1	.231	.167
I.Q.	14.408	1	14.408	10.443 **
School x grade	2.939	3	.979	.71
School x sex	1.671	3	.557	.404
School x I.Q.	3.312	3	1.104	.8
Grade x sex	.623	1	.623	.452
Grade x I/Q.	1.413	1	1.413	1.024
Sex x I.Q.	.751	1	.751	.544
School x grade x sex	1.357	3	.452	.328
School x grade x I.Q.	6.998	3	2.333	1.691
School x sex x I.Q.	2.468	3	.823	.596
Grade x sex x I.Q.	.159	1	.159	.116
School x grade x sex x I.Q.	2.091	3	.697	.505
Total	418.057	303	1.380	

* F is significant with probability less than .05
** F is significant with probability less than .01

TABLE 46 - The analysis of variance table of the combination of process variable shows significant differences at grade and I.Q. levels. The school factor is not a significantly discriminating main effect, neither does it appear in conjunction with a significantly discriminating interaction. Hence, there is no significant difference between IPI and non-IPI schools at any level. The combination of process variable is based on the manipulative handling and understanding of the four basic computational skills which were examined before. The fact that very distinctly differentiating trends in the area of multiplication and division do not manifest themselves in these findings is apparently due to their accidental exclusion from this section of the test. With this in mind, the results as implied by Table 46 concur with earlier observations.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 47
IPI MATH - FRACTIONS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	18.894	3	6.298	4.459 **
Grade	37.880	1	37.880	26.816 **
Sex	1.490	1	1.490	1.055
I.Q.	24.632	1	24.632	17.437 **
School x grade	42.480	3	14.160	10.024 **
School x sex	2.858	3	.953	.674
School x I.Q.	4.962	3	1.654	1.171
Grade x sex	3.389	1	3.389	2.399
Grade x I.Q.	.173	1	.173	.122
Sex x I.Q.	3.890	1	3.890	2.754
School x grade x sex	2.455	3	.818	.579
School x grade x I.Q.	11.172	3	3.724	2.636 *
School x sex x I.Q.	11.071	3	3.690	2.612 *
Grade x sex x I.Q.	1.529	1	1.529	1.083
School x grade x sex x I.Q.	7.337	3	2.446	1.731
Total	428.012	303	1.413	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 47 - The analysis of variance table shows significant differences at school, grade, and I.Q. levels. These differences, however, are not independent of other levels as is indicated by the significant interactions of school x grade, school x grade x I.Q. and school x sex x I.Q.

TABLE 47a IPI MATH - FRACTIONS

I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
87	2.859	55	2.931	126	2.331	67	2.323	19.437

TABLE 47a - A comparison between IPI and non-IPI schools produced no significant differences. However, the relatively very high F ratio is the product of a pronounced tendency of the IPI school students to achieve higher scores for their work on fractions than the non-IPI students.

TABLE 47b IPI MATH - FRACTIONS
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	1.9	39	3.06	70	1.67	35	2.19	10.518
5	31	3.82	16	2.8	56	2.99	32	2.45	10.021

TABLE 47b - A comparison between IPI and non-IPI students when broken down by schools and grades produced no significant differences at any level. The null hypothesis, therefore, cannot be rejected. The relatively high F ratios, as indicated by the means are a product of individual grade achievement rather than an indication of the differences between IPI and non-IPI students. At the fourth grade level Brentwood School has scored a relatively low average whereas Grant Wood has compensated for it by its relatively high achievement. This tendency is reversed at the fifth grade level where Brentwood has achieved the highest mean point average of the four schools. The individualistic tendency of the four groups is further underlined by a decline in grade point average of Grant Wood's fifth graders compared with the fourth graders of the same school, whereas in all other schools the fifth graders attained better averages than the fourth graders of the same institution.

TABLE 47c

IPI MATH - FRACTIONS
Comparison of Means two at a time

		I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	H	25	2.75	11	3.1	43	3.028	8	3.333	0.712
5	H	14	3.606	9	3.7	37	3.528	17	3.356	0.321
4	L	31	2.325	28	2.685	27	2.944	27	2.733	2.387
5	L	17	3.317	7	2.792	19	3.434	15	2.973	0.040

Table 47c - A comparison of means, two at a time, when broken down by school, grade and intelligence shows no significant differences between IPI and non-IPI students at any level. The null hypothesis of no difference can, therefore, not be rejected.

TABLE 47d IPI MATH - FRACTIONS

Comparison of Means two at a time

		I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
SEX	IQ	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
F	H	13	3.35	10	3.3	38	2.53	16	2.76	5.898
M	H	26	2.8	11	3.62	47	2.91	11	2.22	1.112
F	L	28	2.57	20	2.37	16	1.86	24	1.50	.062
M	L	20	2.72	26	2.42	37	2.01	19	2.82	0.931

Table 47d - A comparison between means, two at a time, when broken down by schools, sex and intelligence, shows no significant differences between IPI and non-IPI students at any level. The null hypothesis of no difference can, therefore, not be rejected. The relatively high F ratio of the high intelligence girl's group indicate a slight tendency on the part of high IPI girls to achieve higher means than their non-IPI counterparts. The incongruence of the last observation with some of the earlier findings may, in this particular case, be a by-product of the highly individualistic tendencies which the fraction variable has incurred. It seems that the individual classroom situation and not the program is the predominate force producing the differentiating trends.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 48
IPI MATH - MONEY

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	1.683	3	.561	.794
Grade	13.185	1	13.185	18.662 **
Sex	1.034	1	1.034	1.463
I.Q.	9.293	1	9.293	13.154 **
School x grade	4.870	3	1.623	2.298
School x sex	1.826	3	.609	.861
School x I.Q.	2.557	3	.852	1.206
Grade x sex	1.454	1	1.454	2.058
Grade x I.Q.	.02	1	.02	.029
Sex x I.Q.	2.348	1	2.348	3.323
School x grade x sex	1.762	3	.587	.831
School x grade x I.Q.	1.103	3	.368	.520
School x sex x I.Q.	4.358	3	1.453	2.056
Grade x sex x I.Q.	.024	1	.024	.033
School x grade x sex x I.Q.	.102	3	.034	.048
Total	214.078	303	.706	

* F is significant with probability less than .05
** F is significant with probability less than .01

TABLE 48 - Only two main effects, grade level and I.Q. level discriminated significantly. Therefore, there is no significant difference between IPI and non-IPI students in their achievement on the money variable as measured by the IPI test, not even to the extent of identifying trends or tendencies.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 49
IPI MATH - TIME

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	2.697	3	.899	1.147
Grade	11.459	1	11.459	14.624 **
Sex	.206	1	.206	.263
I.Q.	5.044	1	5.044	6.437 *
School x grade	4.693	3	1.564	1.996
School x sex	.755	3	.252	.321
School x I.Q.	.78	3	.26	.332
Grade x sex	.273	1	.273	.349
Grade x I.Q.	.958	1	.958	1.222
Sex x I.Q.	.621	1	.621	.793
School x grade x sex	5.502	3	1.834	2.340
School x grade x I.Q.	3.988	3	1.329	1.696
School x sex x I.Q.	.376	3	.125	.16
Grade x sex x I.Q.	.259	1	.259	.331
School x grade x sex x I.Q.	.614	3	.205	.261
Total	237.431	303	.784	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 49 - Only two main effects, grade level and I.Q. level discriminated significantly. Therefore, there is no significant difference between IPI and non-IPI students in their achievement on the time variable as measured by the IPI test, not even to the extent of identifying trends or tendencies.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 50
IPI MATH - SYSTEMS OF MEASUREMENT

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	15.636	3	5.212	5.515 **
Grade	29.220	1	29.220	30.922 **
Sex	12.44	1	12.44	13.164 **
I.Q.	17.26	1	17.26	18.265 **
School x grade	4.535	3	1.512	1.6
School x sex	5.501	3	1.834	1.94
School x I.Q.	.194	3	.065	.068
Grade x sex	.032	1	.032	.034
Grade x I.Q.	.335	1	.335	.355
Sex x I.Q.	.436	1	.436	.462
School x grade x sex	.315	3	.105	.111
School x grade x I.Q.	3.03	3	1.01	1.069
School x sex x I.Q.	.956	3	.319	.337
Grade x sex x I.Q.	4.688	1	4.688	4.961 *
School x grade x sex x I.Q.	1.025	3	.342	.362
Total	286.33	303	.945	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 50 - The analysis of variance table of systems of measurement shows that school, grade, sex and I.Q. levels discriminated significantly. The significant interaction of grade x sex x I.Q. discloses the inter-dependency of the last three main effects.

TABLE 50a IPI MATH - SYSTEMS OF MEASUREMENT
Comparison of Means two at a time

I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
77	2.692	55	2.232	126	2.859	67	2.707	12.300

Table 50a - A comparison between means, two at a time, when broken down by schools, reveals no significant difference between IPI and non-IPI schools. However, the relatively large F ratio is the product of the non-IPI schools' tendency to score higher on this variable than the IPI schools.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 51
IPI MATH - GEOMETRY

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	5.868	3	1.956	3.46 *
Grade	.367	1	.367	.649
Sex	1.413	1	1.413	2.499
I.Q.	1.086	1	1.086	1.922
School x grade	3.848	3	1.283	2.269
School x sex	.878	3	.293	.518
School x I.Q.	.627	3	.209	.37
Grade x sex	.605	1	.605	1.07
Grade x I.Q.	2.988	1	2.988	5.286 *
Sex x I.Q.	.023	1	.023	.04
School x grade x sex	.455	3	.152	.268
School x grade x I.Q.	.790	3	.263	.466
School x sex x I.Q.	.806	3	.269	.475
Grade x sex x I.Q.	.082	1	.082	.145
School x grade x sex x I.Q.	1.249	3	.416	.737
Total	171.277	303	.565	

* F is significant with probability less than .05
** F is singificant with probability less than .01

Table 51 - The analysis of variance of the geometry variable shows that schools are a discriminating factor. There is also a significant interaction of grade x IQ.

TABLE 51a IPI MATH - GEOMETRY
Comparison of Means two at a time

I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
	1..444		1.439		1.821		1.626	20.200

Table 51a - The comparison of means, two at a time, when broken down by schools reveals no significant difference between IPI and non-IPI schools. The null hypothesis of no difference can, therefore, not be rejected. However, the relatively very high F ratio is the product of a pronounced tendency of non-IPI students to score higher on this variable than their IPI counterparts. This observation is of interest since the geometry material as presented by the IPI test was considered a unique part of the IPI program.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 52
IPI MATH - SPECIAL TOPICS

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	37.406	3	12.469	15.739 **
Grade	12.084	1	12.084	15.254 **
Sex	1.37	1	1.37	1.729
I.Q.	2.968	1	2.968	3.747
School x grade	16.608	3	5.536	6.988 **
School x sex	.310	3	.103	.131
School x I.Q.	2.039	3	.68	.858
Grade x sex	2.459	1	2.459	3.104
Grade x I.Q.	.186	1	.186	.235
Sex x I.Q.	.774	1	.774	.977
School x grade x sex	6.245	3	2.082	2.627
School x grade x I.Q.	1.454	3	.485	.612
School x sex x I.Q.	1.178	3	.393	.496
Grade x sex x I.Q.	.094	1	.094	.119
School x grade x sex x I.Q.	3.392	3	1.131	1.427
Total	240.042	303	,792	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 52 - The analysis of variance of the variable dealing with special topics denotes schools and grades as significant discriminators. The interdependency of these discriminators is amplified by the significant school x grade interaction.

TABLE 52a

IPI MATH - SPECIAL TOPICS
Comparison of Means two at a time

I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
37	1.34	55	1.75	126	0.894	70	0.722	48.888 *

* P = less than .25

Table 52a - The comparison of means, two at a time, indicates that IPI students achieved better results than non-IPI students at less than the .25 level of significance. This result is not unexpected since the special topics as defined by the IPI math test are unique to the IPI program and students in the non-IPI schools have had less experience with them than with any of the other topics included in the test.

TABLE 52b

IPI MATH - SPECIAL TOPICS
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	0.77	39	1.92	70	0.55	35	0.54	32.266 *
5	37	1.9	16	1.58	56	1.23	32	0.90	18.520

* P = less than .25

Table 52b - The comparison of means, two at a time, when broken down by schools and grades reveals that the fourth grade IPI students achieve better results than their non-IPI counterparts at less than the .25 level of significance. At the fifth grade level this difference is no longer significant. The null hypothesis of no difference at the fifth grade level can, therefore, not be rejected. However, the relatively very high F ratio at the fifth grade level is still the product of a pronounced tendency of the fifth grade IPI students to achieve better results on this variable than their non_IPI counterparts. The tendency of Grant Wood's fifth graders not to perform as well as its fourth graders accounts, in part, for the smaller F ratio.

ANALYSIS OF VARIANCE SUMMARY TABLE FOR DEPENDENT VARIABLE 53
IPI MATH - TOTAL

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F RATIO
School	196.137	3	65.379	.935
Grade	2485.09	1	2485.09	35.542 **
Sex	83.977	1	83.977	1.201
I.Q.	2006.819	1	2006.819	28.702 **
School x grade	1272.382	3	424.127	6.066 **
School x sex	140.869	3	46.956	.672
School x I.Q.	140.547	3	46.849	.67
Grade x sex	108.666	1	108.666	1.554
Grade x I.Q.	.493	1	.493	.007
Sex x I.Q.	159.188	1	159.188	2.277
School x grade x sex	31.332	3	10.444	.149
School x grade x I.Q.	310.675	3	103.558	1.481
School x sex x I.Q.	195.661	3	65.22	.933
Grade x sex x I.Q.	189.418	1	189.418	2.709
School x grade x sex x I.Q.	87.229	3	29.076	.416
Total	21185.47	303	69.919	

* F is significant with probability less than .05
** F is significant with probability less than .01

Table 53 - The total math score comprises the entire achievement on all the twelve variables of the math test. The analysis of variance denotes grade and I.Q. levels as significant discriminators. There is a significant interaction of school x grade.

TABLE 53a

IPI MATH - TOTAL
Comparison of Means two at a time

	I.P.I. SCHOOLS				NON-I.P.I. SCHOOLS				
GRADE	N	SCHOOL 1	N	SCHOOL 2	N	SCHOOL 3	N	SCHOOL 4	F RATIO
4	56	3.24	39	3.82	70	3.83	35	3.82	0.086
5	37	4.65	16	4.06	56	4.5	32	4.11	0.003

Table 53a - The comparison of means, two at a time, when broken down by schools and grades shows no significant differences between IPI and non-IPI schools at any level. The null hypothesis of no difference can, therefore, not be rejected.

SUMMARY OF THE IPI MATH TEST

In retrospect, the IPI math test produced information of a slightly different slant than that derived from the other tests. The most significant difference is that the school effect as a discriminator plays a relatively minor role. Only in 5 out of 14 variables analyzed could differences be traced to the characteristics of the schools. Furthermore, sex as discriminator disappeared, except in two cases. Most differences were accounted for by variance at grade and I.Q. levels. In other words, the IPI math program as represented by the IPI math test has proved to be of sufficient universal nature in the schools which were investigated as to transcend, in most cases, sex and school differences. The success of a student in this program is primarily determined by his aptitude and the amount of schooling he has received.

In general, the interaction analysis indicates that existing differences, even relatively substantial ones, originate at the fourth grade level. At the fifth grade level these differences are either substantially reduced or they disappear altogether. This phenomenon exists regardless of whether the advantage is in favor of the IPI groups or the non-IPI groups. It may, therefore, be assumed that as far as the IPI program is concerned, its divergencies from the conventional are obliterated at the fifth grade level. Such interpretation would, naturally, cast serious doubts on Research for Better School's analysis of materials which underlines the tremendous difference between the math IPI program and conventional math programs as measured by standardized achievement tests.

It is noteworthy that most difference tendencies at the fourth grade level are in favor of the non-IPI groups. These differences exist in the areas of numeration, place value, multiplication and division. A possible explanation for this occurrence may reside in the IPI pacing sequence, namely that these areas are primarily covered at the fifth grade levels in the IPI schools.

SUMMARY OF THE IPI MATH TEST (cont'd)

Among the fourteen areas of the IPI program tested, there were two more in which the non-IPI schools as a whole showed definite tendencies to achieve higher scores than the IPI schools. These areas were systems of measurement and geometry. Only in two areas; Special Topics and Fractions, did the IPI schools at all grade levels show a relatively overwhelming advantage. These are the only variables among fourteen which may be claimed to be convincingly divergent from the conventional math program. The sub-analyses of these variables conflicts with observation made earlier. Girls of both lower and higher intelligence levels achieved higher scores in the IPI schools than their counterparts in the non-IPI schools. It is difficult to assess such an isolated phenomenon partly contradicted by the sub-analysis of the numeration variable in which low groups tend to achieve higher results in non-IPI settings.

III. DISCUSSION

Formally the analysis of fifty-three learning variables has not produced statistically significant results in favor of either IPI schools or non-IPI schools. It may, therefore, be maintained that District 59 IPI fourth and fifth graders do as well in the area of math and language as other fourth and fifth graders in the same district. Neither was it established that the IPI program had a significant influence on the achievement of the gifted population as it was defined in this paper, or any other segment of students on the basis of school, grade, sex or I.Q. level.

Several reasons may account for these observations:

1) Hetereogeneity of the schools and their populations. A slight divergency in I.Q. scores discriminating against certain segments in the IPI schools has been discussed earlier. These differences, however, had very slight, if any, affect on the results since they were observed at the fourth grade level whereas most tendencies to differ were observed at the fifth grade level. It is assumed, therefore, that the different characteristics of a certain school population resides in the domain of student and teacher characteristics as well as in the schooling process which may not be related at all to any specific program.
2) The IPI input did not suffice to produce any significant changes in achievement. The reasons for this explanation may be embedded in an ineffective application of the program, the nature of the program itself or a combination thereof.
3) The insensitivity of the instruments and the conservative data treatment. In this respect a certain amount of crudeness was imposed on the instruments by the necessity to limit tests both in scope and time.

Relating these findings to other empirical evidence, the closest analogy, at this time, can only be found in the vast volume of studies in the area of programmed instruction. Most investigations in programmed instruction relate only to a very specific and narrow element of the curriculum extending over a relatively very short period of time. Findings, therefore, are strongly influenced by the Hawthorne effect. [16]

In spite of the fact that most investigations of programmed instruction were experimentally designed and only a few were ex post facto studies, there is no convincing evidence to the effect that programmed instruction is superior to other methods of instruction in terms of improving achievement levels of students. Stephens summarizes in these words:[17]

> "It is too soon to sum up the evidence on programmed instruction. In the flood of reports now appearing (Lumsdaine 1964), however, there is much to suggest that this device is about on a par with other methods of individual study (Poppleton and Austwick, 1964; Owen and others, 1965). It may permit an average saving of time over straight classroom approaches, but its overall superiority to classroom teaching is by no means apparent (Feldhusen, 1963; Feldman 1965)."

IPI is an elaboration and expansion of programmed instruction ideas and principles. As such the general observations of this study concur with Stephens' statement.

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[16] See for example the evidence assembled in Hughes, J.L. Programmed Instruction for Schools and Industry, SRA Publishers, Chicago, 1962 pp. 42-50.

[17] Stephens, J.M., The Process of Schooling, Holt Rinehart and Winston, Inc., 1967. pp. 82

A curtailment on gleaning information because of rigorous statistical definitions would, however, doom many useful observations of trends and tendencies which may constitute more solid foundations for future hypotheses and decisions. This paper's major contribution lies in the identification and interpretation of such trends and tendencies which are hereby presented not as absolute and definite statements, but as what seemed the most likely diagnosis of the findings:

1) Continuous and rather consistent observations were made with regard to the discrepancies between verbal and numerical skills. Whereas differences between IPI and non-IPI students in the verbal areas were few and unobtrusive to the degree of literal extinction, the differences in the numerical skills showed a certain degree of advantage in favor of the non-IPI students.

    a) The differences in the language area were slight to begin with when measured on the full Iowa Test. However, when checked by the Part-Iowa Test, the writing sample and the IPI test results showed a consistent indication that IPI and non-IPI students do equally well. There is even some reason to assume that the IPI program has opened to a certain segment of its students new avenues in creative writing.

    b) Reference skills constitute a separate part of the Iowa Test, whereas they are included in the IPI language test. Most objections with regard to having covered materials fell into this category. The Iowa Test, indeed, indicated a disadvantage of IPI students in this area even after the elimination of the material which was not covered. On the other hand, the IPI test showed no differences between IPI and non-IPI students in the

1) b)(cont'd)

area of reference skills. It, therefore, may be assumed that the IPI student who follows a different program is at disadvantage when tested in the area of reference skills on a standardized test.

c) Some disadvantage of IPI students in the area of mathematics when compared with non-IPI students is the most consistent trend that has manifested itself in this investigation. Although the IPI test softens some of the findings of the Iowa Test and part-Iowa Test it denotes that in certain areas of the IPI program non-IPI students have acclaimed greater success than their IPI counterparts. Regardless of the location of these differences (mainly at the fourth grade level) and their scope,the question of transfer of learning is warranted at this point. Results indicate that the non-IPI students have little, if any, difficulty to adjust achievement wise to the demands of the IPI program. In reverse, IPI students have displayed more rigidity.

2) Transfer of learning may be implied in varying degrees by the results in their entirety. Thorndike, Ferguson and others observed that transfer is most effective when the area of transfer is closely and directly associated with previous learning experiences.[18] The feasibility of transfer in this study has been proven by the non-IPI students achievement on IPI material both verbally and numerically. The standardized tests used in this investigation in full or abbreviated form suggest that learning flexibility of IPI students is more restricted than that of their non-IPI counterparts. This rigidity exists primarily in the

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[18] See for example: Wertheimer, Max, Productive Thinking, Harper and Row, 1959, pp. 34-35.

2) Cont'd

area of mathematics, but there are indications that it also transcends into the area of reference skills and to a very slight degree the area of language skills.[19]

3) There is reason to believe, and this applies to the observations made above, that the effectiveness of the IPI program varies with regard to specific types of students.

4) Interpreting results from the point of view of learning transfer, the general observation is that transfer as a discriminating factor is more apparent at the fifth grade level among certain student populations. At this point it is difficult to refrain from speculating. If the observation is upheld, can it be attributed, among other things, to maturation factors and/or fixation of learning habits?[20] Some indication with regard to fixated learning habits may be gleaned from the work of M.D. Smith who tested, at Harvard, programmed instruction in the area of hydrodynamics and hydrostatics. One of his conclusions was that students in the program showed a tendency to condition their verbal responses without understanding the physical phenomenon and the relationships which the verbal statements represented.[21] Such findings would have direct bearing on learning transfer.

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[19] What has been interpreted as lack of transfer flexibility may, under circumstances, be the product of negative transfer. See *Encyclopedia of Education Research*, 1960, pp. 1535-40.

[20] Experimenters in programmed instruction have voiced concerns that this method may restrict the creativity of the learner. To maintain creativity, Crutchfield and Covington have advocated a series of steps which, to a large degree, have been incorporated into the IPI program. The question whether these modifications are effective enough to eliminate the basic restricting features of programmed instruction still remains to be answered. See for example: Briggs, Leslie J, "Learner Variables and Educational Media", *Rev. of Educ. Research*, April 1968, Vol. 38, pp. 171-2.

[21] Watson, Fletcher G. "Research on Teaching Science" in Gage (Ed) *Handbook of Research on Teaching*, Rand McNally and Co., Chicago, 1965, pp. 1052-54.

5) Sex and intelligence factors as discriminators between IPI and non-IPI students became apparent particularly at the fifth grade level. Evidence to this statement is gleaned from the Iowa Test of Basic Skills tests and, to some degree, from the writing sample and certain segments of the IPI test. The former strongly imply that fifth grade girls of the higher intelligence group tend to achieve bettern in non-IPI settings. There are few indications, particularly in the language area, that the IPI program speaks more to the intelligent male fifth grader. Such statement, however, is presented with much greater caution and reservation.

The relative crudity of the design leaves little doubt of further need to ascertain these observations at more refined and sophisticated levels. However, even at this raw state, results imply an interesting interrelationship between individual characteristic and program. It is generally stated that Individually Prescribed Instruction allows for more individual freedom of decision making. The real effect of such freedom on learning processes has yet to be determined. This paper distinguishes between intellectual and emotional freedom and administratively imposed freedom. Without running the risk of making a judgemental statement, it may be asserted that from the administrative point of view the IPI program imposes on each child a set of classroom behaviors which remove him, to a certain degree, from a constant and incessant monitoring and supervision of the classroom teacher. Such deviation from conventional classroom procedures may have a diverse effect on perceptions of the role of sex as is inculcated by cultural traditions. The maturing girl of the higher intelligence bracket being sensitive of the dependency factors of her sex, may feel more at home in a classroom environment which promotes an administrative

5) Cont'd

dependence. On the other hand, IPI may be more appealing to the intelligent boy who seeks greater opportunities for self-assertion. Apparently, the overtness of role perceptions as manifested by achievement is coupled with maturation factors. This accounts for the fact that they could only be observed at the fifth and not fourth grade level.

Related research implies that there is indeed a correlation between the effectiveness of programmed instruction and student characteristics. Campeau (1965) found that text anxiety of fifth grade girls determines their achievement in specific types of programs. High text anxiety fifth grade girls require programs with constant feedback. Low anxiety girls succeeded most with programs that had no feedback. Text anxiety did not discriminate between boys.

Lublin (1965) testing students who worked on a program in introductory psychology found a correlation between autonomy need and achievement through programmed instruction. Using the Edwards Personal Preference Schedule, autonomy was defined in terms of liking to work without interaction with teacher. Students with high autonomy scores achieved better than those with low autonomy scores.

Kight and Sassenrath (1966) observed a relation between anxiety and retention on programmed materials. High anxiety students worked faster with fewer errors on programmed materials, but retained less than low anxiety students.[22]

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[22] For all these references see Briggs, Leslie J. "Learner Variables and Educational Media" Review of Educational Research, Vol. 38, No. 2, April, 1968.

5) Cont'd

Anxiety, text anxiety and autonomy as defined by the studies quoted above may all be specific manifestations quite common of a group of intelligent girls on the verge of the maturation process. Research has come up with some evidence that characteristics of this type can adversely affect achievement in a programmed instruction situation. Naturally, much evidence is lacking to explain the phenomenon in its entirety. On the other hand, lack of text anxiety, the desire to work without a teacher would be some of the attributes to be expected,to a larger degree,from boys of high ability levels.

6) There are no indications that IPI has a positive effect on the low ability student regardless of sex. In certain instances, there are slight indications that in some areas the low ability student tends to achieve better in a non-IPI setting. Such student may be more prone to rely on a structured classroom situation which provides less opportunity for independent decisions with regard to learning activities. Such learning environment relies more heavily on a textbook and a teacher administrating its content. This assertion is supported by a study made by Feldman who found that students of low ability achieve better results when studying from a text rather than from a program.[23]

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[23] Feldman, Margaret E. "Learning by Program and Text Format at Three Levels of Difficulty", Journal of Educational Psychology 56:133-9, June 1965.

SECTION IV

IV. CONCLUSIONS AND RECOMMENDATIONS

The IPI program has been regarded and interpreted as a derivation and expansion of programmed instruction. Prior to this report two schools, Grant Wood in Elk Grove Village and Brentwood in Des Plaines have been exposed to IPI for two years. Altogether more than 600 students were involved. To measure the effect of IPI on children from the point of view of achievement only the last two grades in these schools were drawn into the examination. These grades were compared with control schools matched on geographic and socio-economic factors. All IPI school children were exposed to the program for two years. Altogether, complete data was obtained on 342 children. Of these, 144 were IPI students and 198 were non-IPI students.

Five different achievement tests were administered to each student: The full Iowa Test of Basic Skills, a part-Iowa Test, a free writing sample, an IPI language test and an IPI math test. In the analysis students were divided into grades, sex, schools and I.Q. levels. The factorial analysis of variance and the Scheffe formula of difference between means, two at a time, were applied in the data treatment.

The analysis of 53 variables did not establish any significant differences between IPI and non-IPI students. Formally, therefore, the statement must be made that IPI and non-IPI students achieve equally well in the areas tested. However, a closer look at results reveals trends which, although not significant, are consistent to a degree of being suggestive of specific phenomena.

IPI as a method has been most effective in the language area, but not more than other methods. In mathematics, results imply, that IPI children do not achieve as well as students taught by other methods. Differences in achievement are interpreted as the ability to retain and transfer learning. Groups which are most affected by differences in achievement were fifth grade girls of the upper intelligence levels who, in certain areas, tended to achieve better results in non-IPI settings than their counterparts in the IPI classes. Slight indications may provide foundation for the assumption that this trend operates in the reverse with regard to fifth grade boys of the upper intelligence level. With regard to students of the lower intelligence group, there are a few indications that hint that they stand better chances of achievement in non-IPI settings.

These findings as well as research imply that the success of the IPI program depends on four factors: 1) content, 2) method of administration, 3) student's characteristics, 4) teacher's role.

Content: There is the possibility that not all subjects or segments thereof are equally ammenable to IPI methodology. IPI's great setback with regard to individualization of instruction is its arrangement of instructional materials on one continuum. Individualization of instruction in an IPI situation consists primarily of certain flexibility with regard to the student's location on that continuum. Materials are arranged so that sequence as well as process are very rigidly prescribed. A student is free to tackle areas of choice on the continuum, he may, after having shown enough competence, skip parts of it or begin work at any designed level, but it is still the same pre-designed and pre-determined continuum. To say that IPI provides each student with a continuum of his own is believing in myth. Any over-organized attempt to define a comprehensive learning continuum which encompasses most individual differences runs the risk of defeating individualization of instruction by becoming dogmatic and inflexible. The reason is that:

Content: (cont'd)

> "All sequences - developmental or logical - were upset from time to time by studies showing the wide difference in the degree and rate of development of all the physical and psychosocial attributes of man. More recently it appears that some of the sequences in the logically arranged subjects may be more fancied than real, with the results that there is less reason than ever to conform to many of the logical sequences."[24]

To solve the problem of content materials ought to be subjected to incessant revisions on a rotation basis. A more pragmatic approach is required with regard to definitions of the learning continuum. In this respect, perhaps, emphasis on the understanding of fundamentals, their translation into simplified symbols and regenerative models [25] is more profitable than investing tedious efforts in organizing a learning continuum which, at best, can only be temporal.

Method of Administration: IPI distinguishes itself from other forms of programmed instruction with regard to the flexibility exercised in the administration and processing of the program. It is in this area that most significant individualization processes take place. The teacher has full latitude to choose any of the forms of classroom instruction known to the profession.

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[24] Encyclopedia of Educational Research, MacMillan Co. 1960, p. 361
IPI teachers' dissatisfaction with IPI materials may relate to this problem. In an opinion survey (1968) originated by District 59 Math Coordinator in which all math teachers of the district participated, the replies of IPI teachers drew special attention. All highly praised the IPI method, but were most critical of IPI math materials. Their replies amounted to saying "the method is excellent, but materials are lousy." The immediate question these replies evoke in the mind of this writer is whether unsatisfactory materials were taught in an excellent way. Such practice may contribute to the inculcation of undesirable learning habits.

[25] Brunner, Jerome, The Process of Education, Ventage Books, 1960, pp. 17-32

Method of Administration (Cont'd)

Mostly, the classroom interpretation of varied administration of instruction is manifested in formal instructional designs such as large and small group instruction, individual tutoring, independent work, lecturing, discussion,etc.

The formal organization of classroom procedures is in reality only a vehicle for basic principles of instruction, some of which are frequently ignored. These should address themselves to the following questions:

1) What is the optimum feedback frequency in a specific case?
2) To what extent should opportunities for self evaluation be provided?
3) When is coaching necessary?[26]
4) To what extent should IPI materials be used for supplementary instruction rather than as core?
5) Which are the areas not amenable to IPI process?
6) What are the optimal sizes of steps within the materials?

Student Characteristics: Certain theses have been advanced that IPI creates changes in students' behavior traits. Evidence to this effect is still shallow and unconvincing. Findings presented in this paper suggest a reversal of such hypothesis. There is more justification to assume that the success of a program depends on existing student characteristics rather than to expect characteristics to change as a result of the program. Stephens in his documented commentary has emphasized the relatively meager influence modern schools exercise on their students.[27]

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[26] Campbell, Vincent N., "Self Direction and Programmed Instruction for Five Different Types of Learning Instruction", Office of Education, U.S. Department of HEW, December 1963.

[27] Stephens, J.M., The Process of Schooling, Ibid.

Other related research has clearly pointed out some relationships between personal attributes and success in programmed instruction.[28] The relevancy of sex maturation and intelligence factors to this relationship have been consistently pointed out throughout this report. These should be further refined by introducing factors related to anxiety, dependency traits, motiviation, etc. There is little doubt that the success of IPI depends on teacher's ability to match student characteristics with the appropriate form of content and process. An overall indiscriminate application of IPI in an entire school irrespective of individual student's characteristics stands in logical conflict with the idea of individualization of instruction which it purports to serve.

Teacher's Role: IPI emphasizes teacher's role as a diagnostician, affective instructor and motivator.[29] Such change in emphasis requires an entirely new approach to professional training. Having little background in diagnostic activities, teachers rely most heavily on diagnostic tests attached to the IPI program. Such tests alone are insufficient because they are solely geared to a particular program of learning sequences. The shortcomings of such programs have already been discussed. Most other diagnostic functions are based on the intuition of the individual teacher. In the light of the emphasis on the focal importance of diagnostic performance in an IPI setting, professional equipment to diagnose learning effectively and prescribe suitable learning programs based on individual needs seems to be grounded on shaky foundations. A thorough and comprehensive teacher training program is required to upgrade teachers' performance with the competencies required by the IPI program. In this respect Glaser makes the following statement:[30]

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[28] Briggs, Leslie, Ibid. pp. 170-1
Also, see for example: Woodruff, Arnold; Shmabukurg, Shinkishi, "Studies of Individual Differences Related to Performance on Programmed Instruction" Cooperative Research Project No. 3129, Northern Illinois University, 1967.

[29] In this respect, IPI has realized the ultimate hope of programmed instruction. Watson, Fletcher G., "Research on Teaching Science", in Handbook of Research on Teaching, Gage (Ed.), p. 1054.

> "Special professional training must be provided to school personnel that they can accomplish the evaluation and diagnosis of student performance that is required in order to organize instruction for programs. Teachers must become increasingly competent in the theory and practice of education diagnosis, evaluation and guidance. Currently the teacher is trained in the total class management of learning. In contrast, teachers' must now learn how to adapt instruction to sub-groups of students and to the individual student."

IPI is the first comprehensive attempt of a systematic generation of a learning program dictating not only a sequential scale of learning processes, but also incorporating, at least formally, the basic ideas and principles of individualized instruction. Its attraction, perhaps, is mainly in that it forced the educator to tackle problems of individualized instruction in the classroom, rather than conveniently talk about them. From this point of view incongruencies and deficiencies of the program are secondary in importance.

One advantage of IPI is the many hours of painstaking preparation and research that have been invested in it. Thanks to it education has a rare tool which can be conveniently used in the process of generating a systematic body of knowledge about individualization of instruction to replace the endless stream of guesswork and hortative statements which incessantly thread their way through professional literature. This, however, can only be attained by continuous penetrating research questioning its very foundations.

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[30] Glaser, Robert, "The Education of Individuals", Learning Research and Development Center, University of Pittsburgh, September 1966, p. 6.

BIBLIOGRAPHY

Austin, Mary C. and Morrison, Coleman. The Harvard Report on Reading in Elementary Schools. The MacMillan Company, 1963.

Biddle, Bruce J. and Elena, William J. Contemporary Research on Teacher Effectiveness. Holt, Rinehart and Winston, 1964.

Boyer, Gil and Scanlon, Robert, Mimeograph, 1968.

Briggs, Leslie J. "Learner Variables and Educational Media" Rev. of Educational Research, Vol. 38 No. 2, April, 1968.

Brunner, Jerome. The Process of Education. Ventage Books, 1960.

Campbell, Vincent N. "Self Direction and Programmed Instruction" Office of Education, U.S. Department of Health, Education and Welfare, December, 1963.

Cox, Richard C. "A Description and Interim Evaluation Report Concerning the First Two Years of Individually Prescribed Instruction Project" Mimeographed Working Paper, December, 1966.

Downie, N. M. and Heath, R.W. Basic Statistical Methods. Harper and Brothers, New York, 1959.

Encyclopedia of Education Research, 1960.

Feldman, Margaret E. "Learning by Program and Text Format at Three Levels of Difficulty" Journal of Educational Psychology, Vol. 56, June 1965.

Ferguson, George A. Statistical Analysis in Psychology and Education. McGraw Hill, 1966 (2nd Edition)

Filep, Robert (Ed) Prospectives in Programming. The MacMillan Company, New York, 1962.

Glaser, Robert. "Research and Development Issues in Programmed Instruction" in Filep, Robert (Ed) Prospects in Programming. The MacMillan Company, 1962.

Glaser, Robert. "Individualized Learning: Notes on a Rationale of Individually Prescribed Instruction" Learning Research and Development Center. University of Pittsburgh, Mimeograph, 1966.

Glaser, Robert. "The Education of Individuals" Learning and Research Development Center, University of Pittsburgh, September, 1966.

Green, Edward J. The Learning Process and Programmed Instruction. Holt, Rinehart and Winston, New York, 1967.

Hays, William, Statistics for Psychologists. Holt, Rinehart and Winston, New York, 1963.

Hill, Joseph and Kerber, August, Models, Methods and Analytical Procedures in Educational Research. Wayne State University Press, 1967.

Hughs, J.L. Programmed Instruction for Schools and Industr. SRA Publishers, Chicago, 1962.

Kuethe, James L. The Teaching-Learning Process. Scott Foresman and Company, 1968.

Research For Better Schools. Mimeograph, 1968.

Stephens, J.M. The Process of Schooling. Holt, Rinehart and Winston, Inc. 1967.

Thomson, Robert L. L. "Programmed Instruction and Reinforcement Theory: A View From The Laboratory" in Filep, Robert T. Prospectives in Programming. The MacMillan Company, 1962.

Watson, Fletcher G. "Research on Teaching Science". Gage (Ed) Handbook of Research on Teaching. Rand MacNally Co. Chicago, 1965.

Wertheimer, Max. Productive Thinking. Harper and Row, 1959.

Winer, B.J. Principles in Experimental Design. McGraw Hill, New York, 1962.

Woodruff, Arnold and Shmaburkurg, Shinkishi. "Studies of Individual Differences Related to Performance on Programmed Instruction" Cooperative Research Project No. 3128, Northern Illinois University, 1967.

APPENDICES

Appendix B

NAME____________________ ____________________________

1-5 ID. __ __ __________

6 Grade __________

7-8 TEACHER__________

CARD 2 1-8 SAME AS CARD 1

IOWA

9-10 Vocabulary ______

11-12 Reading Comp. ______

13-14 Spelling ______

15-16 Capitalization ______

17-18 Punctuation ______

19-20 Usage ______

21-22 Total Test ______

23-24 Map Reading ______

25-26 Graphs ______

27-28 References ______

29-30 Total Test ______

31-32 Arith. Concept ______

33-34 Prob. Solving ______

35-36 Total Test ______

PART IOWA

37-38 Vocabulary ______

39-40 Reading Comp. ______

41-42 Spelling ______

43-44 Capitalization ______

45-46 Punctuation ______

47-48 Usage ______

49-50 Total Test ______

51-52 Map Reading ______

53-54 Graphs ______

55-56 References ______

57-58 Total Test ______

59-60 Arith. Concept ______

61-62 Prob. Solving ______

63-64 Total Test ______

WRITING SAMPLE

65-66 Spelling ______

67 Style ______

68 Originality ______

69 Handwriting ______

70 Total ______

PRE IOWA

9-10 Vocabulary ______

11-12 Reading Comp. ______

13-14 Total ______

15-16 Mechanical ______

17-18 Spelling ______

19-20 Total ______

IPI ENGLISH

21 Phonetics ______

22-23 Structure ______

24 Vocabulary ______

25-26 Comprehension ______

27 Library Skill ______

28 Reference ______

29-30 Total Test ______

IPI MATH

31 Numeration ______

32 Place Value ______

33 Addition ______

34 Subtraction ______

35 Multiplication ______

36 Division ______

37-38 Combination of Process ______

39 Fractions ______

40 Money ______

41 Time ______

42 Systems of Measurement ______

43 Geometry ______

44 Special Topics ______

45-46 Total ______

BACKGROUND DATA

47-49 I.Q. ______

50-53 Age ______

54 Sex ______

55 Fr. School ______

56 Mother Work. ______

Appendix C

Card 3 Side II

NAME____

1-5 ID. __ __ ____

6-7 Vocabulary ____

8-9 Reading Comp. ____

LANGUAGE SKILLS

10-11 Spelling ____

12-13 Capitalization ____

14-15 Punctuation ____

16-17 Usage ____

18-19 Total Test ____

WORK-STUDY SKILLS

20-21 Map Reading ____

22-23 Graphs ____

24-25 References ____

26-27 Total Test ____

ARITHMETIC SKILLS

28-29 Concepts ____

30-31 Prob. Solving ____

32-33 Total Test ____

Dear Student:

Have you ever thought of the future? As a matter of fact, we are in school in order to prepare for the things that may happen to us in the future, but things do not always just happen. Sometimes we can make them happen if we want them very much. What, then, would you like to do when you grow up?

Please write on the following page about some of the things you would like to do when you grow up. Do not write more than one page.

APPENDIX F

OFFICE USE ONLY

SP__________
STY__________
OR__________
HA__________
TOT__________

WHAT I WANT TO DO WHEN I GROW UP

Appendix

SUGGESTED INSTRUCTIONS TO RATERS

Dear Rater:

Thank you for your willingness to cooperate in the continuing evaluation of District 59 curriculum materials. Your professional assistance in this matter is both appreciated and invaluable to our study.

We have gathered writing samples from fourth and fifth grade students enrolled in several schools in District 59 and are asking you to read and evaluate a number of them. In order to facilitate our interpretation of your ratings we would like you to use the following procedure:

1. The papers that you will evaluate will be rated along several dimensions:
    - a. Spelling
    - b. Style
    - c. Originality
    - d. Handwriting

   Total (overall quality) evaluation will also be assigned. Evaluate the dimensions and the total evaluation as follows:

    - a. Spelling, style, originality, handwriting. Indicate the quality of each of these dimensions by your choice of one of the following:

        Excellent
        Good
        Sufficient
        Questionable
        Bad

    - b. Total (overall quality) evaluation. Indicate your feelings about the overall quality of the paper (based on spelling, style, originality, handwriting) by choosing one of the following:

        Excellent
        Good
        Sufficient
        Questionable
        Bad

2. Briefly scan all of the papers you have been given to evaluate to familiarize yourself with both content and general quality.

3. Now read and evaluate each of the writing samples you have.

DATE ____________________

NAME ____________________
first last

SCHOOL ____________________

CLASS ____________________

TEACHER ____________________

To the Teachers:

In order that the results of this test be useful, there should be some standardization of testing procedure.

1) There is no need for "scratch" paper - there is room for work on test sheets.

2) Read the instructions to the student. This is aimed at encouraging him to do his best work.

3) The time for the test should be 45 minutes and should be accurately gauged. Many students will complete the test in less time. Encourage them to check it over and try any problems skipped. However, do not let these people disturb those not finished.

4) Encourage "dawdlers" to move along. These can be observed by quietly moving about the room.

5) There should not be a need to "explain" any question unless there is an obvious typographical error.

Good luck and thanks,

To The Students:

Hello! Today you are taking the part of a scientist in doing the work on this test. The results will help to make the teaching of mathematics better in this school and other schools. So try to do your very best work. We hope you will find some questions which are interesting and fun to puzzle out. There may be some questions which are different. However, give an honest try on all questions, but do not spend too long on any question.

Good luck, Scientist

Data
use
only

Math Test - page 1

1. The number which is 10 more than 742 is ________.

2. The numeral for 10 tens and 12 ones is ________.

3. What number is one greater than 9999? ________

4. The number 1000 more than 3742 is ________.

5. Circle the number which is even, prime and a factor of 12.

4 3 2 12 5

6. What digit is in the tens place of 198? ________

7. Fill in the blank to make a true sentence.

174 = 100 + ________ + 14

8. The smallest 4 digit number is ________.

9. Circle the largest number.

23032, 2332, 23023, 23022

10. Write the smallest four digit number using 5, 3, 6, 2 as digits each used only once.

____

11. Fill in the blank to make the sentence true.

$$4 + 9 = 4 + \underline{\qquad\qquad} + 3$$

12. Find the sum.

$$\begin{array}{r} 14 \\ +\ 12 \\ \hline \end{array}$$

13. Add:

$$\begin{array}{r} 9 \\ 7 \\ 8 \\ 5 \\ 4 \\ 3 \\ \hline \end{array}$$

14. Add:

$$\begin{array}{r} 241 \\ 324 \\ 413 \\ \hline \end{array}$$

15. On a vacation trip Mr. Howlett drove 257 miles on the first day, 386 miles on the second day and 521 miles on the third day. How far did Mr. Howlett drive for a total on those three days?

16. Subtract:

$$\begin{array}{r} 13 \\ -6 \\ \hline \end{array}$$

17. Subtract:

$$\begin{array}{r} 42 \\ -\ 13 \\ \hline \end{array}$$

18. Subtract:

$$\begin{array}{r} 801 \\ -\ 566 \\ \hline \end{array}$$

19. Subtract:

$$\begin{array}{r} 1612 \\ -\ 985 \\ \hline \end{array}$$

office
use
only

20. 715 people went to the Fair. 117 of them were adults. The rest were children. 263 of the children were boys. How many were girls?

____

21. Fill in the blank to make the sentence true.

5 X __________ = 40

22. Fill in the blank to make the sentence true.

3 + 3 + 3 + 3 = __________ x 3

23. Multiply: $\begin{array}{r} 26 \\ \underline{\times\ 6} \end{array}$

24. Multiply: $\begin{array}{r} 32 \\ \underline{\times\ 47} \end{array}$

25. Bill earned 4¢ for each Sunday paper he delivered. One Sunday he delivered 24 papers. How many cents did he earn that day?

____

26. Divide: 10 ÷ 5 = __________

27. Divide: 27 ÷ 3 = __________

28. Divide: 8 ÷ 8 = __________

office use only

29. If a teacher wishes to divide 30 cookies among 10 children so that each would get the same amount, how many would each child receive?

________ ________

30. Divide:

$3\overline{)6030}$ ________ ________

31. Fill in the blank to make the sentence true.

2 + ________ = 10 - 3 ________

32. Fill in the blank to make the sentence true.

18 - 6=6 + ________ ________

33. Write the simplest numeral for

(5 + 2) - 3 + 1 ________ ________

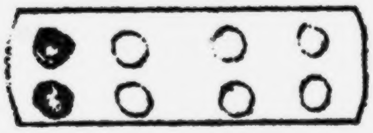
34. Put > , < , or = inside the circle to make a true sentence.

10 + 15 ○ 5 x 5 ________

35. Jane started with $5.00. She earned $2.50 and then spent $3.25. How much did Jane have then?

________ ________

36.

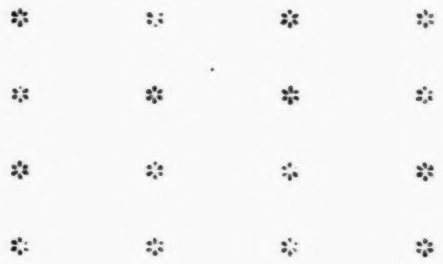


What fraction tells what part of the set is black?

________ ________

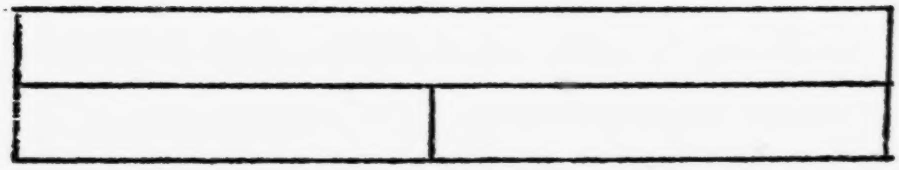
office
use
only

37. Draw a circle around $\frac{3}{4}$ of the stars.



______

38.



If the long rectangle represents the number 1, then what number would each of the smaller rectangles represent?

______ ______

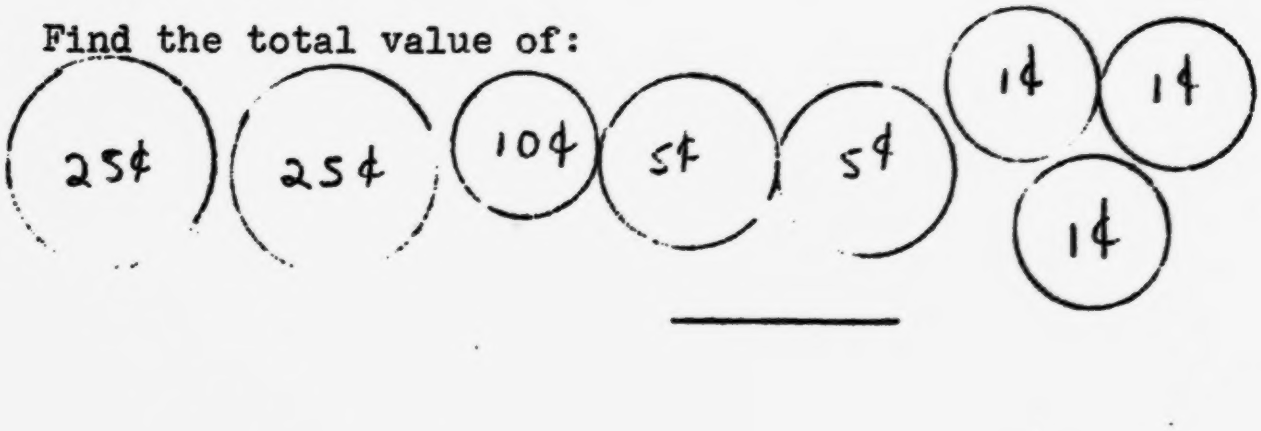
39. Complete $\frac{1}{4}$ of 16 = ______ ______

40. Complete $\frac{3}{10}$ X 60 = ______ ______

41. How many dimes would you have to save in order to exchange them for one dollar?

______ ______

42. Find the total value of:



______ ______

office use only

43. Charlie gave the cashier of the restaurant $1.00 for his lunch and received 35¢ in change. How much did Charlie pay for his lunch?

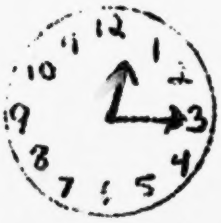
____

44. Mr. Finson bought 6 giant ice cream cones for 25¢ each and he bought four small ice cream cones for 10¢ each. How much change did Mr. Finson receive from $10.00?

____

45. There are __________ days in one week.

46.



Write the time shown by the clock.

____

47. Chris left his home at 8:10 a.m. to go to school. It took him 13 minutes to get there. What time did he arrive?

____

48. If May 1 is on a Wednesday, what day of the week would May 23 be?

____

49. There are __________ minutes in one hour.

50. Complete the following:

2 feet + 10 inches = __________ inches.

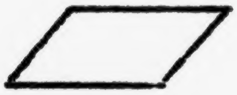
office
use
only

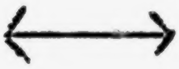
51. How many quarts are needed to fill a 3 gallon pail?

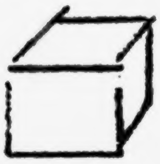
52. Circle the unit you would use to measure an angle.

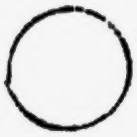
inch degree centimeter square inch

53. Circle the figure which represents a cube.

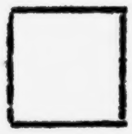


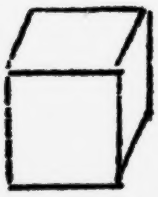




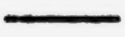


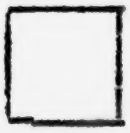
54. Circle the unit which would be used to measure the inside of a rectangle.

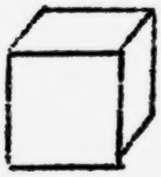


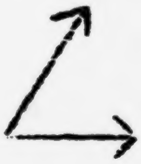


55. Circle the unit which would be used to measure volume?

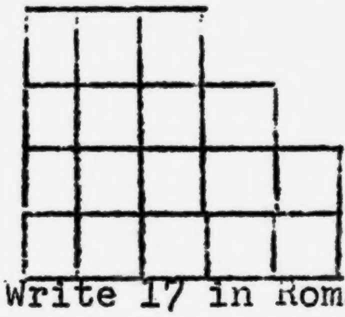








56 Find the perimeter of this figure.



57. Write 17 in Roman numerals.

office
use
only

58. Circle the number which has the same value as 10^3.

103 30 100 130 1000

____

59. If you are twenty-fifth in line and your friend is eighteenth in line, how many people are between you and your friend.

____

____

60. Circle the number which has the same value as .25

$\frac{25}{1}$ $\frac{25}{10}$ $\frac{25}{100}$ $\frac{25}{1000}$

____

DATE ____________________

NAME ____________________
first last

SCHOOL ____________________

CLASS ____________________

TEACHER ____________________

STUDENT'S GENERAL DIRECTIONS SHEET

You are to mark your answers on the special answer sheet with your pencil. Since your papers will be scored by machine, you must follow the directions for recording your answers carefully to make sure that you get full credit for your work.

You are first to print your last name--one letter per box--in the boxes which are titled "LAST NAME" across the side of the page. Then print your first name initial and then your middle initial. Then in the column below each of your printed letters you are to blacken the rectangle corresponding to the letter at the top of the column. Use a pencil and mark heavily.

Your answers to the test items should be made by filling in the proper rectangle. Use a pencil and mark heavily. FILL THE RECTANGLE COMPLETELY. BE SURE THAT YOU DO NOT GO OUTSIDE OF THE RECTANGLE. Look at the examples below. Notice that the entire rectangle has been filled in each case.

- -

__Example__

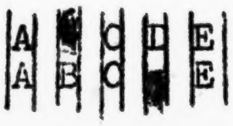
67. The only word in the following list which contains a long vowel sound is:

A. honey
B. toast
C. circle
D. rich
E. friend

Toast is the correct answer. Next to the question marked 67 on the answer sheet the box marked "B" is blackened.

ANSWER SHEET

67.
68.



1. If your answer to question 67 is "B", blacken the box following number 67 and under letter "B" on your answer sheet.
2. Be sure your answers are in the right place. Misplaced answers are counted as wrong answers.
3. If you change your answer, erase your first mark completely.
4. Mark only one answer to each question. If more than one answer is marked, no credit is given for that question.
5. Make no unnecessary marks any place on the answer sheet.

Reading Test

Directions: Circle the letter before the correct answer.

1. All of the following words contain long vowel sounds except

   a. cheese
   b. ride
   c. noble
   d. later
   e. jelly

2. In the word "choice" the underlined letter stands for a sound that is usually spelled with the letter

   a. g
   b. j
   c. k
   d. s
   e. z

3. Which word has the same /oo/ sound as book/

   a. baboon
   b. shook
   c. room
   d. poodle
   e. loop

4. Which word does not contain a silent letter?

   a. riding
   b. write
   c. teacher
   d. structure
   e. known

5. Which word does contain a silent letter?

   a. vacant
   b. absurd
   c. miraculous
   d. riches
   e. noisy

6. Which blend will make a word when added to the beginning letters wor- ?

   a. sp
   b. nd
   c. sk
   d. mp
   e. st

7. Which blend will make a word when added to the ending letters -atch?

   a. thr
   b. scr
   c. sch
   d. chr
   e. spl

8. Which word has the same vowel sound as cheap?

   a. feed
   b. bread
   c. hearth
   d. friend
   e. clever

9. Which of the phonetic rules apply to the word notion?

   a. The /oi/ sound can be spelled two ways, as in toy and oil.
   b. When kn occurs at the beginning of a word, the k is silent.
   c. In an open syllable the vowel is usually long.
   d. When y appears in any position in a word except at the beginning of a syllable, it stands for a vowel sound.
   e. The /t/ sound is usually spelled with a t.

10. The compound word is divided incorrectly in item

   a. play/ground
   b. fire/man
   c. ginger/bread
   d. works/hop
   e. snow/ball

11. The suffix -ment in the word government means

   a. not, the opposite of
   b. state of being
   c. one who
   d. full of, having the qualities of
   e. able to

12. The following words are all correctly spelled except

   a. slammed
   b. capped
   c. tripping
   d. sobbed
   e. spining

13. In the word America there are how many syllables?

    a. 1
    b. 2
    c. 3
    d. 4
    e. 5

14. The following words are divided into syllables. Which one contains no open syllables?

    a. rack et
    b. ea sy
    c. tri fle
    d. re call
    e. res cue

15. The root word is correctly underlined in all of the following words except

    a. seventeen
    b. beautiful
    c. oversee
    d. dissolved
    e. underestimate

16. In all the following words the ed stands for a /d/ sound except in

    a. tied
    b. walked
    c. turned
    d. primed
    e. bobbed

17. The plural forms are correctly written for all of the following words except
    a. key, keys
    b. puppy, puppies
    c. monkey, monkeys
    d. fly, flys
    e. army, armies

18. A good synonym for the word seldom in the sentence, "Jerry seldom played with the other children," would be

    a. always
    b. often
    c. never
    d. happily
    e. rarely

19. In which of the following words is the accented syllable incorrectly marked?

a. teach´ er
b. pro vide´
c. re peat´
d. pur ple´
e. pre ´view

20. Each of the following items includes a suffix, a word using that suffix, and a meaning for the suffix. In which item does the meaning not fit the suffix?

a.	- ous;	famous;	full of
b.	- able;	notable;	able to be
c.	- ward;	backward;	in the direction of
d.	- less;	luckless;	full of
e.	- er;	farmer;	one who does

21. An antonym for the word found in the sentence, "Father found his hat in the oven," would be

a. mislaid
b. baked
c. uncovered
d. remembered
e. discovered

22. "The tired horse bobbed his head up and down with each weary step that he took." From this sentence you can tell that the horse is traveling __________ .

a. rapidly
b. alone
c. with a herd of horses
d. slowly
e. on a country road

23. In which of the following sentences has the wrong homonym been used?

a. The boy was bear-footed and in ragged clothing.
b. The horse's tail was long and silky.
c. Janie could only stare at the strange, little men.
d. The whole thing seemed odd to Tim.
e. I shall sew the button on now, thought Sally.

24. In which sentence is the homograph head improperly used?

a. His head was filled with many thoughts.
b. The cowboys tried to head off the cattle before they reached the pass.

c. Slim was the kind of fellow who could talk your head off without ever saying anything important.

d. He had headed in the wrong direction when he drove away from the motel.
e. Johnny wished now that he had headed his father's advice.

25. In the sentence, "Hoping no one would notice, Elmer surreptitiously returned the stolen watch," the word surreptitiously means

a. secretly
b. noisily
c. quickly
d. happily
e. slowly

26. In the sentence, "The old gentlemen felt he had been jostled quite enough by the long ride in the carriage over rough roads," the word jostled means

a. cuddled
b. forgotten
c. laughed at
d. bumped
e. made happy

Read the following story; then answer Questions 27-31.

When Henry left the YMCA this particular Wednesday, he stopped to watch a man tear down a circus poster. Then, with three dimes and one nickel in his pocket, he went to the corner drugstore to buy a chocolate ice cream cone. He thought he would eat the ice cream cone, get on the bus, drop his dime in the slot, and ride home.

That is not what happened.

"He bought the ice cream cone and paid for it with one of his dimes. On his way out of the drugstore he stopped to look at funny books which cost twenty cents. It was a free look, because he had only two dimes and one nickel left."

27. Which of the following lists puts Henry's actions in the correct order?

a. left the YMCA; bought an ice cream cone; watched a man tear down a poster

b. looked at funny books; ate ice cream; went into the drug store

c. left the YMCA; went home on the bus; bought ice cream
d. ate ice cream; looked at funny books; went to the YMCA
e. left the YMCA; bought ice cream; looked at funny books

28. Circle the letter before the phrase which tells something that Henry did not do.

a. bought a chocolate ice cream cone
b. went home on the bus
c. went to the YMCA on Wednesday
d. paid a dime for his ice cream
e. took a free look at the funny books

29. The following things are not told in the story. Which one of them do you know is true because of what the story does tell you?

a. Henry's father is a policeman.
b. Henry is a dog.
c. Henry rode the bus home.
d. Henry was on his way home.
e. Henry has a sister.

30. Although the story does not tell you, which of the following statements is most likely to be true?

a. Henry liked ice cream.
b. Henry did not like dogs.
c. Henry's mother was angry with him.
d. Henry's aunt was a circus performer.
e. Henry often disobeyed his parents.

31. Which of the following statements is a true statement?

a. Henry did not buy a funny book because he did not have enough money.
b. Henry planned to ride the bus home because he was afraid of the dark.
c. Henry took a free look at the funny books because he planned to use his money for something else.
d. The man was tearing down the circus posters because he hated circuses.
e. Henry went to the YMCA only because his parents forced him to.

Read the following story; then answer Questions 32 - 33.

The most famous bell in the world is a bell that never rings. It has not rung for over one hundred years. Yet people come from all over the country to look at it. It is the Liberty Bell, and the story of its life is as exciting as the story of our country. In fact, it is the story of our country.

32. A good title for the paragraph you have just read would be

    a. The Story of Our Country
    b. An Exciting Story
    c. A Famous Bell
    d. A Story About Bells
    e. The Bell That Never Rings

33. The topic sentence of this paragraph is

    a. The most famous bell in the world is a bell that never rings.
    b. It has not rung for over one hundred years.
    c. Yet people come from all over the country to look at it.
    d. It is the Liberty Bell, and the story of its life is as exciting as the story of our country.
    e. In fact, it is the story of our country.

Read the following paragraph; then answer Questions 34-36.

Paul and Maureen Beebe lived on their grandfather's pony ranch on the island of Chincoteague, just off the Virginia shore. Across a narrow channel lay another island, Assateague, which was the home of the wild herds. These ponies were said to be the descendants of Spanish horses off a Spanish galleon that had been shipwrecked there several hundred years ago. Once every July the men of Chincoteague crossed the channel to Assateague and rounded up the wild ponies. They swam them to Chincoteague across the channel to be sold on Pony Penning Day.

34. The main idea of the paragraph is

    a. ponies are hard to capture
    b. pony ranches are enjoyable places to be
    c. wild ponies are better than tame ponies
    d. the pony farms on Chincoteague got their ponies from the wild herds on Assateague
    e. Pony Penning Day is held every July

35. Which of the following statements is opinion rather than fact?

    a. There are wild ponies on Assateague.
    b. The wild ponies are the descendents of Spanish horses.

c. Paul and Maureen lived on their grandfather's pony ranch.
d. Chincoteague is just off the Virginia shore.
e. Assateague is near Chincoteague.

36. From the details told in the paragraph you can guess that the rest of the story will be about.

a. cowboys and Indians
b. Spanish horses
c. a vacation on Chincoteague
d. Christmas at grandfather's pony ranch
e. capturing the wild ponies

Read the following paragraph, then answer question 37.

Quietly but quickly Danny got to his feet and walked along the water's edge to where he had left his old rowboat. Long yellowed grass bending over the water made the boat invisible from above. Danny parted the dry stalks, He pushed the boat over the crunching gravel and jumped in it as it floated free. He dipped his oars as silently as possible, not knowing when a shadow along the shore might be the enemy. It would take hours to get home this way, but he didn't dare go by the road. He might be captured--or shot!

37. In this paragraph the author has used two sets of descriptive words. The one set -- "quietly but quickly" and "as silently as possible" -- describes Danny's movements; the other set -- "yellowed grass," "dry stalks," "crunching gravel" -- describes conditions which made it hard for Danny to move quietly. What was the author's reason for using these two sets of words in the same paragraph?

a. to build up the reader's awareness of the danger Danny was in.
b. to confuse the reader
c. to amuse the reader
d. to frighten Danny
e. to warn the reader that Danny would not get home safely.

38. Which of the following sentences does not belong in the same paragraph with the others?

a. Henry liked to go to the pet store.
b. The windows were full of puppies and kittens.
c. Just before Easter there were rabbits and baby chicks and ducks.
d. Henry's goldfish had not been feeling well lately.
e. Inside there was usually a parrot or a monkey.

39. The best word to complete the blank in the sentence, "The plane looked like a big __________, hovering endlessly," would be

    a. pig
    b. box
    c. sheet
    d. tomato
    e. bird

40. In the sentence, "The distant trees were nodding their great greenish-grey heads yes to the spring thunder-showers" the underlined phrase means that

    a. the trees were glad that it was raining
    b. the trees were going to sleep
    c. the wind caused the tree-tops to bob about
    d. the trees did not like the rain
    e. the wind was mistreating the trees.

41. The first sentence in a paragraph is "Nancy brought in a huge fish-shaped platter piled high with codfish cakes fried a very dark brown." The best ending sentence for the same paragraph could be

    a. "It looks like they kept on cooking after I took them from the stove."
    b. "I like codfish cakes."
    c. "We could have gone fishing some other day."
    d. "Nancy had always looked like her mother."
    e. "None of Nancy's friends were able to come to her birthday party."

42. Which of the following statements is most likely to be imaginary, because is not likely that it would happen.

    a. Jet airplanes fly from Chicago to New York in less than two hours.
    b. Cowboys sometime had to work outdoors in blizzards.
    c. Scientists will be able to land a man on the moon in a few years.
    d. The old man had a wonderful machine which would turn old furniture into living trees.
    e. The little dog saved his master's life by leading him through the swamp to safety.

Using the following index, answer questions 43-46.

alligator, 58, 95
amphibians,
- eggs of, 19, 138
- eye of, 95
- organs of balance of, 96

Archimedes, 6
aristotle, 6
balance of nature, 153-163
Beagle, H.M.S., 12,13
biosphere, 7-24, 26
birds,
- circulatory system of, 78
- embryo of, 118
- eye of, 95
- kinds of, 142

43. How many pages give information about the "balance of nature"?

a. 1
b. 5
c. 11
d. 8
e. 3

44. The items listed in this index indicate that it is from a book about

a. space travel
b. the science of life
c. vacations
d. war
e. birds

45. If I wished to know what or who Archimedes and Aristole were, I should look at page number

a. 29
b. 243
c. 5
d. 64
e. 6

46. If I wished to read about the "eggs of amphibians," I would need to read how many pages?

a. 6
b. 2
c. 4
d. 2
e. 8

921 Peare, Catherine Owens
K
The Helen Keller Story.

Thomas Y. Crowell, 1959

110 p.

Using the library catalog card pictured above, answer questions 47-50.

47. The author of the book is

   a. Thomas Y. Crowell
   b. Helen Keller
   c. Catherine Owens Peare
   d. Peare Catherine Owens
   e. Helen Keller Story

48. The call number you would use to find this book in the library is

   a. 1959
   b. 921 K
   c. 110 p.
   d. All of the numbers listed in a, b, and c
   e. None of the above

49. The book is

   a. a biography
   b. fiction
   c. an adventure story
   d. a mystery
   e. science fiction

50. This kind of catalog card is known as the

   a. subject card
   b. author card
   c. title card
   d. trading card
   e. none of these

51. The guide words at the top of one page of a dictionary are net and new moon. Which of the following words would not be found on that page?

a. neither
b. never
c. neutral
d. new
e. nettle

52. In which of the following lists are the words incorrectly alphabetized?

a. carriage, carrier, carrot, carry, cartoon
b. kimono, kin, kind, kindergarten, kindly
c. member, memory, men, menace, mend
d. divide, divine, division, do, dobbin
e. lift, lifeline, light, lily, line

53. Sometimes the word you are looking up in the dictionary is listed under an entry form that differs from the one you have found in your reading; for instance, to find the definition of oxen. You would look up ox. Which of the following words is the form you would find actually used as an entry word in the dictionary?

a. slept
b. children
c. walked
d. woman
e. hopping

54. Which of the following pronunciation markings is correct for the word resign?

a. /re zīn′/
b. /rā′zin/
c. /ri sīn′/
d. /rē′zin/
e. /rē sīn/

55. In the sentence, "My new watch cost in the neighborhood of $35.00," the best definition for the phrase "in the neighborhood of" is

a. nearness
b. a place or region near
c. an approximate amount
d. the people living near one another
e. a section lived in by neighbors

56. Which one of the following things will an author usually not tell in the preface of his book?

a. why he wrote the book
b. what is emphasized in the book
c. some of the people who have helped him prepare the book
d. what he hopes the book will accomplish
e. information about his personal life

57. Which of the following words is not correctly divided into syllables?

a. ve sper
b. vis ta
c. fu tile
d. ge om e try
e. ded i cate

58. The following five items are a main topic and four subtopics in an outline. Circle the letter before the item that is the main topic.

a. the value of taking notes
b. outlining as an aid in note-taking
c. note-taking
d. using paraphrasing in taking notes
e. using your notes